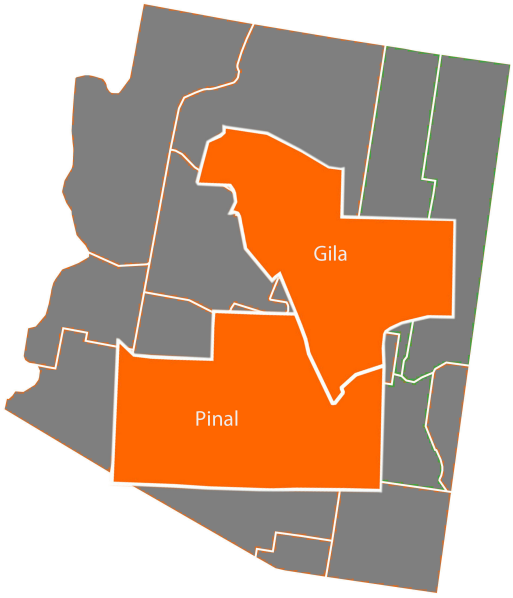
Central Arizona

Broadband Technical Report



with special focus on

North Copper Corridor	South Copper Corridor	Northeast Gila County	US 60 Corridor
Dudleyville	Mammoth	Payson	Claypool
Superior	San Manuel	Pine	Globe
Kearny	Oracle	Punkin Center	Miami
Hayden	Saddlebrook	Star Valley	Superior
Winkelman	OracleJunction		

For Arizona Strategic Enterprise Technology Office (ASET)

April 27, 2014

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Central Arizona
Broadband Technical Report

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Central Arizona
Broadband Technical Report

Preface

Job creation, better education, and improved health and safety contribute to the economic development of a region and are the intended results of reliable access to high-speed, high-capacity internet services. Just as last century's roads, rail, waterways, and power formed the strategies and development of a region, so does a better Internet influence commerce and well being today.

Arizona recognizes its duty to support community and regional efforts that lead to these results. One initiative in particular has provided funding to help rural populations assess their current situations and shortfalls. This report is a product of that funding, which was provided through the Digital Arizona Program, which developed the Broadband Arizona Project with funding from the American Recovery and Reinvestment Act. The Arizona Strategic Enterprise Technology Office oversees and manages the distribution of funds for this program and its projects.

Development efforts in Arizona's Central Region have recently included a type of assessment that identifies technological and other deficiencies specific to individual communities throughout the region. Even in cities very close to Metro Phoenix like Apache Junction we find large gaps in coverage. Analyzing such gaps provides the factual foundation for developing business cases for improving high-speed, high-capacity Internet access. These business cases provide road maps that comprise the strategies and tactics a community uses to start up and sustain its development efforts. And the data in the business cases provide a basis for measuring the success of a community's efforts.

There are several **Digital Arizona Program (DAP)** initiatives at the state level. The **Arizona Broadband Map** portal (http://www.digitalarizona.gov/Maps/Arizona_Broadband_Maps.html) offers interactive insight to broadband coverage across the state and the community planning version integrates substantial demographic and economic data to aid policy analysis and planning.

DAP has recently launched an **Arizona Broadband Speed Test** (http://www.digitalarizona.gov/Survey/AffiliationQuestion.html) for gathering information about broadband coverage and performance across the State. They are strongly encouraging Central Arizona broadband stakeholders to take the speed test periodically to determine statewide broadband capabilities.

The **Arizona Strategic Enterprise Technology Office (ASET)** coordinates these initiatives. Their office address is 100 N. 15th Ave. Suite 400, Phoenix, AZ 85007, and their main phone number is: (602) 542-2250. Additional information and resources may be found online at the ASET website: http://aset.azdoa.gov/ and the Digital Arizona Program's (DAP) website at http://DigitalArizona.gov/. The DAP primary email address is question@DigitalArizona.gov.

As directed the Consultants conducted multiple meeting and training sessions in support of the following goals:

Provide technical assistance to areas and communities with broadband deficits, including:

a. Middle-mile infrastructure deficits
b. Last-mile broadband availability deficits
c. Broadband adoption deficits

Improve broadband capabilities, in the categories above, to enhance the prospects for an area's economic development, education, health care, and quality of life.

Identify the required resources, capital, and expenses required deploying critical applications and missing infrastructure to support:

d. Economic Development/Jobs
e. Education and Distance Learning
f. Tele-health

Develop a plan to accomplish the improvements listed above (may include new ways to increase adoption or improve middle mile capacity, new investment in last mile delivery, better redundancy etc.).

Disclaimer: This report is written by One Random Act (ORAct) LLC, a telecommunications consulting firm. None of the information in this report should be construed as official public policy of regional government or the Arizona State government. However, funding to assist in producing this report came from a federal NTIA grant managed by an Arizona State agency.

Executive Summary

Communities and regional populations must identify people who will commit to “Champion” the local broadband-development efforts. Such champions need to know the stakeholder constituency extremely well and must work to keep those stakeholders engaged in the effort. These champions must be local, engaged and supported by experts not influenced by the Carriers in the marketplace.

A coalition or consortium that includes champions and stakeholders must develop a coherent development plan that clearly establishes implementation responsibilities. The complexity of telecommunications deployment means that a broad spectrum of expertise will be required.

The four guideposts to remember when producing a champion and coalition are:

SKILL Must be able to lead, develop consensus, and manage.
WILL Must be genuinely interested in bringing forward community needs.
AUTHORITY Must be recognized as having legitimate authority to converse and lead.
BUDGET Nothing happens without money. Find a way to sustain funding beyond planning.

These four guiding principles linked with demand aggregation are the keys to success. It is unlikely that high-speed Internet infrastructure will magically drop from the sky into your community or region.

Your champions and stakeholders must be creative enough to produce the business incentives that make Internet provisioning feasible. It is about the money. Additionally, you must show your population the benefits that will come from a better Internet, and you need to show providers that doing business with your community is a gainful proposition.

Communities have the responsibility to manage the data that is gathered. This data will come from various sources: surveys, events, public comment, various paperwork, and elsewise. It is incumbent on the champions and stakeholders to fit this data into the big picture in a way that makes it easy to see where the risks and opportunities reside.

Next, invite the Carriers into the mix as suggested by Mr. Michael Sherman of ASET near the end of 2013. They have the information you desire for Broadband plan development. In Central Arizona we will use an open forum and invited the Carriers to attend.

Recognizing that there are areas of rural America whose broadband needs are unserved or underserved, Congress through the American Recovery and Reinvestment Act of 2009 (the “Recovery Act”), appropriated $7.2 Billion for broadband grants, loans, and loan guarantees to be administered by the United States Department of Agriculture’s Rural Utilities Service (the “RUS”) and the Department of Commerce’s NTIA. These funds are targeted to help with the investments needed to bring broadband to poorly served rural areas of the country and have been allocated with the hope that our rural broadband infrastructure deployment and service availability will improve.

Connecting rural America with adequate broadband is being compared to the Rural Electrification Act of 1935 and the Federal-Aid Highway Act of 1956, helping to bring electric and telephone service to all rural areas of the country and later connected rural areas to urban areas through interstate highways, transforming rural economic and social life.

Arizona's rural communities are now receiving Community Broadband Planning and Technical Assistance help. ASET and its non-profit partner, the Arizona Telecommunications & Information Institute (ATI Institute - http://aztii.org/), have qualified and approved a cadre of consultants who have been selected by regional government coalitions to provide strategic planning, technical assistance, grant writing, e-commerce training and assistance across Arizona's rural areas. Central Arizona leadership engaged **One Random Act (ORAct) LLC** under the grant to achieve the following goals:

- Evaluate, Plan and Build Local Broadband Capacity
- Identify and Engage Community Stakeholders
- Conduct Regional Broadband Events and Training Exercises
- Create Strategic Plans for Digital Inclusion and Broadband Projects
- Provide Technical Assistance to Assess Community Assets and Broadband Capabilities
- Develop Business Cases and Plan for Demand Aggregation
- Determine Broadband Applicability to Regional Rural Job Opportunities
- Identify and Investigate Grant Opportunities
- Promote Community Engagement

This **Central Arizona Broadband Technical Report** focuses on extensive gap analysis including broadband services and infrastructure availability for the Central Arizona region and selected communities. It also provides background on relevant broadband technologies and recommends community broadband strategies, policies, and initiatives. This **Central Arizona Broadband Technical Report** is complemented by a companion **Central Arizona Broadband Business Case Analysis (BCA) Report** and the development of both are funded by a federal National Telecommunications and Information Administration (NTIA) grant awarded to the State of Arizona. ASET, along with legislature and our Governor, have taken steps to improve our regulatory environment including passage of the Digital Arizona Highways Bill (aka SB1402) that allows and encourages providers to use ADOT rights-of-way to place fiber optic infrastructure along roadways. We hope to see the deployment of middle mile fiber infrastructure occurring along a number of State highways with associated local access and last mile connectivity going forward.

The results of Central Arizona regional broadband analyses from a rich variety of data sources confirm that rural Arizona requires better high-speed broadband capacity to keep pace with the modern world. Given the expansive, often difficult rural terrain across the state of Arizona, community-serving organizations like libraries, public schools, and healthcare facilities as well as enterprises and residents at home often have difficulty accessing high-speed broadband services essential for education, commerce, and economic development. The data gathered indicate that broadband offerings in the Central Arizona region are diverse in capacity and cost, and very spotty in coverage, leaving many residents and businesses without a better Internet experience option.

Maps developed during this process show significant "dead zones" or underserved areas as can be seen in the appendices of this Central Arizona Broadband Technical Report. In addition to these areas that lack coverage it is important to understand that a number of homes and businesses within the shown wireless coverage areas cannot obtain wireless service at broadband speeds or at all because they are blocked by trees or located in a low-lying area that wireless signals cannot reach. There is anecdotal evidence to suggest that as many as

25% of the homes within the indicated coverage areas cannot receive an adequate wireless connection. Further, in some areas where DSL is generally available, the quality of the copper cabling to some homes is too poor for DSL to work at advertised speeds. However, current wireless Internet service providers have been and seem to be continuing on a path of expanding coverage areas and increasing bandwidth (speed), but understandably aren't willing to make guarantees regarding future services.

While there does not seem to be an overwhelming groundswell of demand in the Central Arizona area for better Internet, there are instances in which the lack of broadband capacity leaves rural small businesses and residents at a distinct disadvantage when compared to their counterparts in more densely populated areas like Phoenix and Tucson. For instance, the FCC has found that access to fixed and mobile broadband services has the potential of benefiting the agriculture business, enhancing educational opportunities, improving health care, enhancing the County's public safety and homeland security needs, assisting individuals with disabilities and offering potentially enormous environmental benefits. Many of the larger businesses located in and around Central Arizona may be generally satisfied with available services as a result of customization and a much higher monthly rate. However, smaller businesses and home-based businesses in more rural areas often have either just one or no broadband Internet service options except for satellite, which retains the issues of latency, data caps, and significantly higher cost. We continue with this **Central Arizona Broadband Technical Report's** gap analysis, including broadband services and infrastructure availability for the Central Arizona region and selected communities, complemented by the **Central Arizona Broadband Business Case Analysis (BCA) Report**.

The conclusions and recommendations included in this document are intended to help with that effort. What are communities currently spending? Use this to develop Requests For Information that can be presented to potential providers. Develop a bottom-line number that represents the demand aggregation of the community or region. Gain support from public institutions, commercial enterprises, non-profits and residential users.

Realize that identified gaps are best addressed with investment incentives. Each stakeholder must recognize that economics guide infrastructure providers. Show how the provider will gain a return on the huge investment of resources and materials made to provide high-speed broadband access to your community.

They are looking for numbers in these areas:

- Local demand as an aggregated total (current spend will help here).
- New uses and users.
- Cost reduction for rights-of-way and fees.
- Reduced time spent on zoning and permitting processes.

Where does Central Arizona stand today as a result of this process?

CAG decided to focus on the Copper Corridor, Miami and the City of Maricopa as a test for the GAP Analysis planning and training for Broadband improvement. The lessons learned here can easily transfer to the other regions of Arizona.

As a result of the work by ORAct CAG discovered what is required to address Broadband in Central Arizona would require work beyond the planning stages of the DAP funding.

During the DAP project there were meetings and conference calls related to a Champion being named for the City of Miami and Globe. During the initial meeting on April 2nd it was discovered that CenturyLink has a fiber built from the eastern Phoenix Metro to the copper mine outside of Superior. Additionally, the San Carlos Apache Telecommunications Utilities, Inc/ TMCI Triplett Mountain Communications http://scatui.com has built broadband network in the area served by CAG and SE Az. In fact coverage area includes Superior, Miami, Globe, Hayden, Winkleman and all the way to Star Valley east of Payson. See MAP of Gila SDBG Project at the end of Appendix F.

The Stakeholder's meeting will be held on April 14th near the end for the DAP Consultants engagement.

CAG has decided to embark on implementing a plan to address Broadband in the Copper Corridor, Cities of Miami and Maricopa. This will require resources and budget beyond the current DAP project.

The education of the CAG team and the City employees will address the middle mile issue facing many rural Arizona communities. The City employee Mr. Urban will preform the function of Champion outside of the scope of this GAP project.

The next steps are outlined in the phased approach outlined in DAP GAP Phase I from 2013. (copied herein). In summary, the Champion must outline a project to include, Broadband need, future needs along with providing location addresses to the carriers. These steps should be taken while keeping in mind that this is an all-or-nothing approach. No picking the easy projects "low hanging fruit" leaving the remaining community members without Broadband.

As this project sunsets, there is enough momentum in Gila County where one of the projects could very well have Broadband in a short period of time.

Central Arizona Broadband Gap Analysis:

The Arizona State Land Department (ASLD) is maintaining the related Arizona Broadband Map at http://broadbandmap.az.gov/map/ loaded with the last broadband data set. Additionally, there is a special Community Planning version of the broadband map available at http://broadbandmap.az.gov/CommunityPlanningMap/ and loaded with demographic data and special analysis tools that will aid community broadband analysis and planning. These tools are designed to mutually serve both Arizona's broadband consumer and provider communities, as well as contribute to State policy and strategic planning. It should help lead consumers to provider web sites and information about their broadband offerings, hopefully becoming an important tool in the Broadband Provider's (BP's) marketing efforts.

The purpose of the Arizona Broadband Assessment Project (AZ BAP) is to identify both the availability and speed of broadband services, and the location of broadband infrastructure throughout Arizona, including middle mile infrastructure and Community Anchor Institutions (CAIs). This project is provided through the American Recovery and Reinvestment Act of 2009 (ARRA) and the Broadband Data Improvement Act (BDIA), and in conjunction with the National Telecommunications and Information Administration (NTIA) and the Federal Communications Commission (FCC). AZ BAP is managed by the Arizona Strategic Enterprise Technology Office (ASET) under the Arizona Department of Administration (ADOA) in partnership with the Arizona State Land Department (ASLD), contractor Data Site Consortium, Inc. and their GIS subcontractor, TerraSystems Southwest (TSSW).

Fresh broadband data was submitted to the NTIA on April 1, 2013 for the Spring 2013 cycle, which attempts to capture and reflect broadband availability and conditions in the field as of December 31, 2012. See Appendices A-C for regional broadband statistics and detailed county and selected population area maps that can be summarized as follows:

Gila County Broadband Overview:

- There is very limited DSL coverage in Gila County with only 54.4% of the population able to get DSL at ≥768 Kbps downstream but a very slim 20.5% can get ≥6 Mbps. All population centers have some DSL coverage, but far from complete and there is additional coverage in the southwest portion of the county. The Arizona broadband mapping team has discovered an issue in processing Frontier's DSL coverage and will make corrections in the pending Fall 2013 submittal, likely resulting in reporting of slightly less coverage.

- There is somewhat better cable modem coverage in some cities of the County with 77.4% of the population having available service, consistently at speeds ≥10 Mbps. All population centers have significant cable modem coverage with some peripheral areas unserved and there is no coverage available outside these population centers.

- Fixed wireless (licensed and unlicensed) has a more extensive footprint estimated to reach 83.9% of the Gila County population with ≥3 Mbps downstream including all population centers, but there is no available service ≥6 Mbps anywhere in the county.

- Mobile wireless in Gila County has a ubiquitous footprint estimated to reach 99.9% of the population at speeds ≥768 Kbps. However, there are virtually no fourth generation

(4G) services with speeds ≥3 Mbps downstream available, currently limited to 2.0% of the population and no services anywhere in the county at ≥6 Mbps.

- A very small number of Middle Mile points, almost always fiber fed, are available from CenturyLink, Level3 Communications, and Frontier.

Pinal County Broadband Overview:

- There is very limited DSL coverage in Pinal County with the exception of the larger MPO. Outside of that, only 54.4% of the population able to get DSL at ≥768 Kbps downstream but a very slim 20.5% can get ≥6 Mbps. All population centers have some DSL coverage, but far from complete and there is additional coverage in the southwest portion of the county. The Arizona broadband mapping team has discovered an issue in processing Frontier's DSL coverage and will make corrections in the pending Fall 2013 submittal, likely resulting in reporting of slightly less coverage.

- There is somewhat better cable modem coverage in Pinal County with 77.4% of the population having available service, consistently at speeds ≥10 Mbps. All population centers have significant cable modem coverage with some peripheral areas unserved and there is no coverage available outside these population centers.

- Fixed wireless (licensed and unlicensed) has a more extensive footprint estimated to reach 83.9% of the Graham County population with ≥3 Mbps downstream including all population centers, but there is no available service ≥6 Mbps anywhere in the county.

- Mobile wireless in Pinal County has a ubiquitous footprint estimated to reach 99.9% of the population at speeds ≥768 Kbps. However, there are virtually no fourth generation (4G) services with speeds ≥3 Mbps downstream available, currently limited to 2.0% of the population and no services anywhere in the county at ≥6 Mbps.

- A very small number of Middle Mile points, almost always fiber fed, are available from CenturyLink, Level3 Communications, and Frontier.

Conclusions and Recommendations for Action

Plan ahead. Technology and services change continually. What seems fast or huge today will be slow or trivial next year. Aim for more than what you think you need currently.

Understand that you are developing a business proposition. Be realistic about the costs and benefits, but also be creative. Sometimes value is hidden just as costs can be hidden. Engage continually in order to help bring to light what is hidden.

Identify the champions and give them the power to implement action plans and see that all stakeholders remain engaged. Actively support those efforts. Gratitude is as important as the acknowledgment that the champion is probably providing more than what might normally be called for.

Understand that the private sector will provide much of the incentives for investment. This is partly demand aggregation, but also might involve outright financial support for the community's efforts.

Educate yourself and other stakeholders on the financial considerations of broadband development. The community or region will sustain broadband access with a feasible market, yes, but the initial infrastructure development can be costly. Be creative in finding ways to pay for it. Work with the providers to determine funding needs (produce a Request For Information, or RFI). Engage finance, non-profit, and government experts to determine alternative funding possibilities.

A couple of major barriers to infrastructure development are right-of-way costs and usage fees. Work with your government representatives to determine who establishes these costs and then work with them to lower right-of-way and usage barriers to the benefit of all.

Convince your government representatives and administrators that benefit margins are increased when time-to-market is reduced because permitting, zoning, and other regulatory processes are streamlined or otherwise expedited.

Within each of the two Central Arizona counties and their respective communities, stakeholders and leadership should now put in place strategies and action plans, as described here and in more detail in the **Community Planning Guidelines and Recommendations** of the **Central Arizona Broadband Business Case Analysis (BCA) Report** to meet the emerging broadband capacity requirements so as to support the four key Internet application areas.

The core theme for these action plans is communication among all stakeholders. The importance of maintaining a dialogue between community stakeholder groups, including elected officials, and broadband providers to learn issues and strategize paths forward cannot be over emphasized. We suggest the region undertake a series of short-term (tactical) options followed by a longer-term plan to pursue other, more strategic options. See list below:

Short Term Activities

- Educate citizens about options that already exist.
- Define and aggregate the demands among public institutions, commercial enterprises, non-profits, and residential users, getting pledges of support to purchase services.
- Support the expansion of wireless coverage in each County by facilitating use of existing towers by wireless providers and advocating that wireless providers expand coverage in known problem areas.
- Work with ASET, ATIC/ATI Institute, and others to apply for grants and loans to improve middle mile bandwidth.
- Consider subsidizing infrastructure enhancements through grant funding.

Strategic Plan

In order to use the Internet to its greatest potential (such as operating online businesses, telecommuting, and participating in video-based education) central Arizona should plan for a long-term future that provides reliable Internet speeds in excess of 10 Mbps, perhaps 50-100 Mbps to all homes and businesses. In some cases the schools and businesses will require up to 1,000 Mbps (1 Gbps) to support advanced applications and purposes. Because current offerings don't reach everyone and most are quite limited in bandwidth, central Arizona could undertake the following longer-term activities to improve the situation.

- Encourage wireline telephone providers to apply for grants and loans that would allow them to expand coverage.
- Continue demand aggregation and engage potential providers in reaching practical ROIs by reducing their costs to deploy and operate and/or build a customer base.
- Seek out partnerships to build out a fiber backbone within the cities that would allow either fiber to the home (FTTH) or fiber as a middle mile technology which could potentially be shared between multiple providers and technologies.
- Consider supporting efforts toward a community area network and/or public Wi-Fi.
- Research and consider pilot studies of other wired and wireless technologies.

Priorities

Recognizing an array of diverse needs with many potential solutions, strategic priorities are:

- Options that support improved connectivity to local units of government.
- Options that support economic development and job creation.
- Options that support educational, telehealth, and public safety activities.
- Options that support service to residential users of better Internet as a service.

Expansion of Wireless Coverage by Commercial Providers

Service to end-users

Meet with current and prospective wireless providers to review the coverage map showing known poor or non-existent coverage areas (Appendices B-D) and encourage those providers to specifically target those areas for expanded coverage.

Middle mile infrastructure

Consider working with providers to apply for grants and loans to improve middle mile bandwidth and to make any government owned or controlled conduit or dark fiber part of the dialogue and equation.

Apply for grant funds to subsidize tower and pole installations

Although current wireless providers cover a large portion of this region, many homes are located in heavily wooded areas or at low elevations and thus cannot receive wireless signals. In many cases, the addition of a pole of 60-90 feet would elevate an antenna above the treetops and low hills. Each pole would cost approximately $3,500 - $5,000 to install, though tower assets run in the tens or hundreds of thousand dollars. This is cost prohibitive for most residents or communities. An option to resolve this would be to submit a broadband grant request in which citizens paid a portion of the costs.

Manage a Broadband Request for Information (RFI) Process

Many government entities and private enterprises use a Request for Information (RFI) process to engage the telecom providers, assist in the information gathering process, and guide the development of a possible Request for Proposals (RFP) to follow. At the time of this document's development the State of Arizona Department of Administration (ADOA) and Governor's Office of Education Innovation have developed an information gathering RFI for the purpose of gathering broadband providers' input and improving broadband in schools. That RFI is included as Appendix G of this document as an example and possible template for the creation of a community or regional RFI.

Although there are many steps to ensure success, the basic steps to get started and proceed through the process are listed in the checklist that follows:

- Define broadband gaps, existing services, as well as current and future needs working with regional stakeholders
- Explain the particulars of an RFI process to stakeholders who may participate in purchasing and posit the role and value to the community
- Prepare the RFI including defining expectations and rules
- Identify broadband provider including those currently active in the area, as well as others thought interested and/or willing to enter the regional market area
- Advertise and distribute the RFI with timelines to reply
- Plan for submitted questions and potentially an open Q&A forum
- Issue any needed addendums based on provider feedback and questions
- Review and evaluate responses grading against specific criteria if appropriate

- Review internally what has been learned from the RFI and decide on next steps
- Engage specific providers in further discussions and development of opportunities
- Issue a follow on Request for Proposals (RFP) if deemed appropriate and necessary
- Formalize relationships and contracts with selected telecom providers

Enhance Public Access

Work with GovNet and other large pipe providers to secure services to anchor institutions and then provide high-speed Internet connectivity to other municipal government entities and institutions to facilitate public services.

One possibility is to use Government towers for point-to-point wireless links. The advantages to doing so are that the backbone may already exist and if so, is highly reliable. Another option would be to construct fiber connections between the municipalities' peripheral areas and downtown area for the larger cities. This would be a more expensive option, but could provide more bandwidth.

Actively support non-profit, schools, libraries, and municipal entities that plan to enhance access to broadband and/or provide computers for disadvantaged residents. Examples of supportive actions that stakeholders can undertake might include:

- Provide meeting rooms for training classes and Business Assistance Centers in all areas,
- Establish a volunteer service program in which participants assist with training classes and/or in setting up computers,
- Support a community-led initiative to train and educate members of the community how to use broadband and better Internet,
- Encourage local businesses to donate computers and volunteer their services to support sustainable broadband adoption.

Identify Potential Collaborative Grant Projects

Consider collaborating with ASET and other public-service entities, including neighboring counties, community and technical colleges, healthcare organizations, and K-12 school districts. Each of these entities has valid reasons to promote more available and affordable broadband services in the region, and each has resources or assets to bring to the table, as well as access to a differentiated portfolio of grant resources based on their profile, status, resources, and experience.

For example, healthcare organizations have qualified staff that could conduct remote "house calls" for homebound patients; but this requires reliable, high capacity broadband connectivity to the home. K-12 districts want to ensure students have quality Internet access at home as more and more course material is now available only online. Those districts have land and buildings that could be used to host network equipment sites. There are many possibly avenues and opportunities to explore and consider across the various broadband stakeholder types.

Future Broadband Planning:

The logical progression of this study began with researching the current broadband offerings followed by analyzing the gaps between those and community needs. Using that information, this study and the complementary central Arizona Broadband Business Case Analysis (BCA) Report posited detailed community planning guidelines and recommendations for action. central Arizona needs to begin to address the gaps outlined here and start the remediation of limited access to better Internet. The task force and broadband consultant efforts need to move into outlining feasible ways to fill the broadband chasm and estimating costs and conditions to implement. Some of the potential next steps are detailed above and in the BCA Report, as well as outlined below.

Phase 1 – Inventory, Needs Identification and Gap Analysis

This phase requires a significant effort to continue to gather data about the current status of broadband services, gaps, and needs, including initiatives such as these:

- Open forum style meetings for businesses to provide information about their uses of and needs for broadband.
- Meetings for municipal officials throughout the Region.
- Public meetings with a target audience of citizens from the poorly served areas.
- An invitation to hundreds of area businesses to participate in an online survey regarding needs.
- Brief interviews with businesses located in business parks and a physical review of observable facilities in business parks.
- Additional phone call interviews with central Arizona's largest businesses and institutions.
- A survey mailed to residents regarding service quality.
- A poll of the Internet Service Providers to request and obtain information about offerings, prices and coverage areas.

Phase 2 - Cost Estimating

Any particular augmentation or addition of broadband service coverage and capabilities will have a tangible cost to be considered and weighed in the evaluation process. Current and potential broadband providers will have their own internal ROI models, go to market strategy, capital resources and constraints, as well as owner or shareholder issues. Community demand aggregation and offering of fiber and/or vertical assets at low or no cost can definitely shift the equation, as can grant contributions from a variety of sources. See the section **Understanding and Changing the Broadband Investor Equation** in the **central Arizona Broadband Business Case Analysis (BCA) Report** for an actual equation to consider and examples of how community efforts can change the math.

Phase 3 - Ownership/Operations Models and Potential Partnerships

If during or after the first two phases there is a good case to take action, Central Arizona's stakeholder alliance may choose to give the go-ahead for a study team to evaluate various models to enhance broadband infrastructure to meet current and future needs. Or depending on the circumstances and opportunities choose to pursue specific projects with specific public and private partners. Deliverables for future rounds will include information regarding potential take rate, ownership/operations options, and potential partnerships as well as action plans for moving forward if desired focused on the four selected central Arizona regions.

Potential Broadband Technologies:

In keeping with the State's desire to consider longer-term economic development and the need to be aware of specific broadband technology and market developments, we also examined some broadband technologies that may not currently be available throughout central Arizona, but might be in the future. Specifically this section discusses Middle Mile Fiber and Point-to-Point/Multipoint Wireless, 4G (WiMAX and LTE) Wireless, 5G Wireless, Wireless Broadband from Aerial Platforms, Satellite Broadband, Fiber to the Home and Premises, and Broadband over Power Line (BPL).

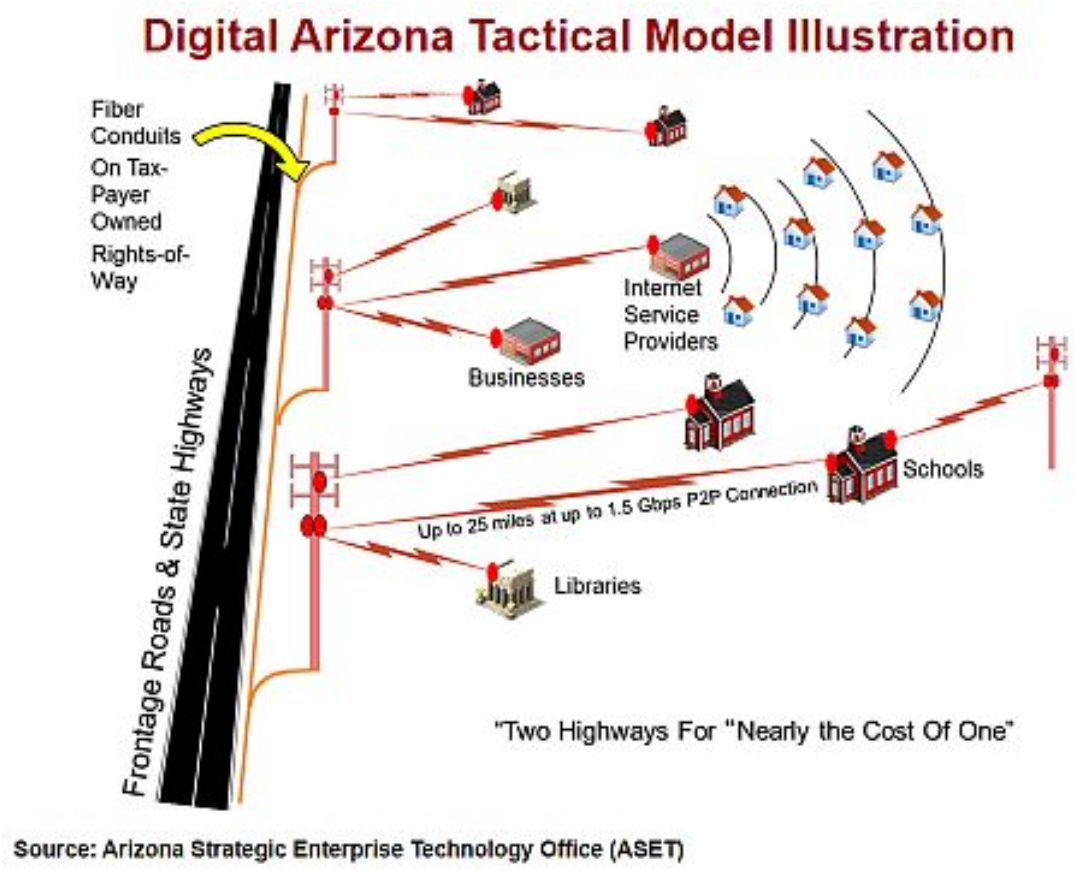
Middle Mile Fiber and Point-to-Point/Multipoint Wireless

ASET, along with legislature and our Governor, have taken steps to improve our regulatory environment including passage of SB1402 (the Digital Arizona Highways Bill) that allows and encourages providers to use ADOT rights-of-way to place fiber optic infrastructure along roadways. Because of the passing of SB 1402, ASET's Digital Arizona Program (DAP) is working closely with ADOA's Public Safety Interoperable Communications (PISC) Office, which has responsibility for FirstNet planning and outreach.

The objective of this effort is to explore synergistic ways of using SB 1402 to potentially lower the costs of expanding rural backhaul infrastructure for use by FirstNet while sharing those expanded resources to benefit educational, healthcare, and economic development uses in rural communities.

An example of a tactical model being considered in Arizona is to deploy middle mile fiber in highway Rights-of-Way that feeds towers from which mobile and fixed wireless broadband can be distributed to nearby communities and populations.

Mobile broadband can be delivered over large swaths of territory for building-based and mobile users at 3G and 4G performance levels, while fixed wireless broadband from the fiber-fed towers can be scaled up to a gigabit per second and higher depending on the equipment selected. Fixed wireless receiving sites in the community may themselves become retransmitters of broadband by various means including via Wi-Fi networks. This is illustrated in the drawing on the following page.



Source: Arizona Strategic Enterprise Technology Office (ASET)

4G (WiMAX and LTE) Wireless

Most mobile providers have begun the process of upgrading their cellular systems to a newer version of mobile wireless technology known as 4G (4th generation). Their initial focus has been on major metropolitan areas, but they are increasingly deploying 4G in the rural areas they have traditionally covered, albeit with some significant lag from the urban area. As the carriers install these network upgrades users see significant improvements in performance that vary according to the capabilities of their phones or other connected devices.

The competition between next generation cellular technologies LTE (Long Term Evolution) and WiMAX (Worldwide Interoperability for Microwave Access) is well underway. WiMAX has been quicker to market and already has operational networks in some areas, but more providers worldwide have announced they will use LTE and have ramped up related investments and deployments leveraging existing cellular network infrastructure.

Since cellular upgrade efforts tend to start in larger metro areas and “trickle down” to less densely populated areas later, customers in rural Arizona may have to wait some time to reap any benefits since the previous generation (3G) of services only quite recently came online in most of this area. However, even after these technologies are implemented, the “footprints” won’t necessarily cover more territory than is now the case. Community-based demand aggregation, measurable economic development and population/traffic growth can help motivate mobile wireless providers to target new geographic areas and increase the size of the covered territory.

Once rolled out, both LTE and WiMAX will provide significantly greater bandwidth than is now

available. The claims for 4G range are for 7 Mbps to more than 20 Mbps downstream while WiMAX can perform in the 100 Mbps+ range. However, such claims should be taken with a grain of salt until there are enough users on the systems to indicate the true capacity when heavily used. Interestingly, WiMAX is often implemented by smaller, regional and local wireless providers using different licensed frequencies than the larger companies.

5G Wireless

Just when you thought we could take a breath on 4G in our marketplace 5G (5th generation) is fast approaching. 4G standards have stabilized and networks are beginning to be deployed and leveraged in advanced mobile applications. With the historical 10-year cycle new generations of cellular advancement, the mobile research community is looking to the next set of innovations in wireless communications networks likely to be deployed around 2020.

No definition for 5G wireless is yet available, but it may well seek to exceed the 4G peak service rates of 100 Mbps for high mobility users and 1 Gbps for low mobility users or at least deliver those rates more consistently and with greater spectral and/or energy efficiency, as well as improved service quality and user experience. As we seek to remain connected all the time to the Internet, the cloud, and to the various technological things (Internet of things) in our lives, wireless networks will continue to be challenged to provide the speed, capacity, and end user service experience desired.

New services and devices will continue to emerge that deliver real-time information and media streaming, as well as leverage location and context based information, providing new capabilities and experiences well beyond those of today. However, in the absence of 5G standards, we will see many wireless technology and services vendors begin to tout their latest ultrafast wireless advances as 5G.

Wireless Broadband from Aerial Platforms

There are quite a few methods of providing high-capacity wireless broadband from aerial platforms placed at stratospheric heights including unmanned aerial systems (UAS) that include a wide variety of drones with powered flight and lighter than air platforms that may be tethered or left to drift with the prevailing winds. These generally haven't been deployed in the U.S. to any significant degree for wide broadband delivery, but they are likely to be at some point.

Some interesting examples include Chandler's Space Data Corporation (http://www.spacedata.net/), which offers a balloon-based SkySite Platform as a low-cost solution for data communications in remote areas with a coverage circle of over 400 miles. They are often used for remote telemetry and military field support, but may find use in cross-continental clusters for filling in the mobile wireless industry's dead zones so often found in rural areas. Google Project Loon (http://www.google.com/loon/) is a similar, though more recent balloon-based wireless platform initiative currently focused on third world environments with little mobile service today.

Satellite Broadband

Satellite-delivered broadband and Internet relies on one or more satellites in geostationary earth orbit (GEO) above the equator, a number of ground stations known as gateways that relay bulk data to and from the satellite via earth to sky radio transmission, and a small satellite dish antenna with a transceiver and modem located at the subscriber's premises.

Smaller businesses and home-based businesses or simply residences in more rural areas often have either just one or no broadband Internet service options except for satellite, which retains the issues of latency, data caps, and significantly higher cost. However, satellite services have been becoming more competitive with higher speeds in the 3-15 Mbps download and more generous data caps, though cost for some remains an issue.

Fiber to the Home and Premises

This method of providing service involves installing fiber optic cabling directly into each building (business or house). This technology is often referred to as Fiber to the Home (FTTH) or Fiber to the Premises (FTTP) across an entire area in comparison to direct Optical Carrier (OC) high capacity fiber circuits generally provided only to specific medium and large enterprise customers.

In some parts of the eastern United States, Verizon Communications has installed this type of service to residential and business customers. Verizon has dubbed its service FiOS. AT&T has also installed some FTTH in portions of Texas. In almost all cases, the providers installed these systems in densely populated, high-income areas. In less populated areas it can be difficult for for-profit companies to justify the cost to install new FTTH systems. There are an estimated 135 FTTH/FTTP projects around the country and such systems are growing significantly, but they still represent a very small portion of the broadband market.

A variation on this theme is to install fiber most of the way and then use copper cabling to reach the last few hundred feet to individual buildings. This type of installation is often referred to as Fiber to the Neighborhood/Fiber to the Node (FTTN). In the cable TV industry, the technology used for the last few hundred feet is usually coaxial cabling while in the telephone industry, it would be the existing phone wire. FTTN can be a phased step toward fiber to the home/fiber to the premise. A fiber to the home network is a major investment with an eye toward major long-term benefits. Those benefits include the following:

- Using fiber rather than copper cabling vastly increases the amount of data that can be transmitted. Fiber to the premise systems typically offer speeds from 10 Mbps to 100 Mbps per subscriber, and bandwidth amounts can be guaranteed, unlike wireless.
- Fiber has virtually unlimited bandwidth potential. 100 Gigabits capacity over 25 miles has been demonstrated, and even greater speeds are expected through ongoing research and development. Installed fiber capacity can often be expanded by changing out termination equipment.
- Fiber is immune to interference and much more secure from eavesdropping.
- Fiber has a long useful lifetime (30+ years) and, unlike wireless technologies, can be considered a long-term asset, rather than something that depreciates in value.

Many communications experts believe fiber is the only truly viable option for the long run and that it is simply a matter of time until everyone requires the service capacity only fiber can deliver. However, practically speaking, fiber broadband connectivity will remain very spotty for some time to come and relatively ubiquitous deployment would require the commitment of substantial investment by the private and/or public sectors that do not seem imminent.

Broadband over Power Line (BPL)

Broadband over Power Line (BPL) can deliver broadband Internet access over electrical power lines. To date, BPL has faced significant technical and market challenges in getting traction with utility companies. There are difficulties with interference as high and medium voltage electrical systems generate unintentional signals in some of the transmission ranges used by wireless networks. There is also the need to install special equipment to bridge signals around the frequent line transformers. The excitement around BPL is that it uses existing electrical power lines to distribute broadband to connected premises. This can mean a much smaller initial investment than bringing in new cabling for other technologies, but trials to date have been modest and the future of this technology in the marketplace remains uncertain.

A related item to keep in mind for BPL and electric utilities is that utilities generally install fiber bundles alongside power transmission lines. Each electric utility company could become suppliers for middle mile better Internet connections by leasing dark fiber and lit capacity. Electric utility companies also own power poles and sometimes street lights that can be leased for attachment of Wi-Fi access points or other wireless infrastructure.

Broadband as Part of Transportation Planning

Transportation Infrastructure

Central Arizona

Broadband Planning into the Transportation Planning documents, procedures and practices is now a normal course of business for the SEDS reports within the counties of Central Arizona and its broadband development task group. Actions are underway addressing the underserved and un-served areas of the Copper Corridor.

Maps were produced and meetings with stakeholders resulted in isolation of two potential broadband network routes heretofore unknown to the community. These routes addressed the lack of middle mile normally seen in rural Arizona. The county stakeholders, jointly with the Consultant, have advanced the practice of broadband planning into the central Arizona transportation planning efforts.

CAG development advocates have connected transportation planning process within broadband as a permanent ongoing practice. A letter attesting to that fact has been provided to ASET in accordance with the implementation deliverables of the Technical Assistance Agreement.

Appendix A: Arizona Broadband Statistics (for Fall 2013)

	Statewide	Rural	Sparsely Pop. Rural			
All Broadband Tech (Except Satellite) 1 or More Providers	**Population**	**Household**	**Population**	**Household**	**Population**	**Household**
≥ 768 Kbps Down	99.55%	99.54%	97.73%	97.81%	95.57%	96.01%
≥ 3 Mbps Down	98.54%	98.34%	92.70%	92.13%	86.58%	86.12%
≥ 6 Mbps Down	97.88%	97.72%	89.36%	89.27%	82.35%	82.16%
≥ 10 Mbps Down	96.92%	96.58%	84.56%	83.86%	74.85%	73.94%
All Broadband Tech (Except Satellite) 2 or More Providers	**Population**	**Household**	**Population**	**Household**	**Population**	**Household**
≥ 768 Kbps Down	98.81%	98.79%	94.04%	94.28%	89.76%	90.39%
≥ 3 Mbps Down	97.06%	96.89%	85.23%	85.28%	77.65%	77.51%
≥ 6 Mbps Down	95.69%	95.28%	79.28%	79.16%	71.05%	70.17%
≥ 10 Mbps Down	93.78%	92.94%	69.68%	68.10%	58.03%	55.55%
All Broadband Tech (Except Satellite) 3 or More Providers	**Population**	**Household**	**Population**	**Household**	**Population**	**Household**
≥ 768 Kbps Down	98.09%	97.94%	90.43%	90.27%	84.31%	84.23%
≥ 3 Mbps Down	95.62%	95.07%	78.18%	76.95%	69.29%	67.41%
≥ 6 Mbps Down	91.76%	90.49%	67.54%	66.02%	56.91%	53.87%
≥ 10 Mbps Down	87.51%	85.93%	48.03%	46.17%	41.31%	39.00%
DSL, xDSL & Other Copper Tech	**Population**	**Household**	**Population**	**Household**	**Population**	**Household**
≥ 768 Kbps Down	93.60%	93.23%	75.61%	75.46%	63.67%	65.27%
≥ 3 Mbps Down	88.16%	87.31%	58.15%	57.89%	44.14%	44.73%
≥ 6 Mbps Down	81.51%	80.14%	44.58%	44.10%	34.42%	34.85%
≥ 10 Mbps Down	72.14%	70.55%	35.39%	35.34%	26.28%	26.40%
Cable Modem Technologies	**Population**	**Household**	**Population**	**Household**	**Population**	**Household**
≥ 768 Kbps Down	89.27%	88.62%	55.48%	55.50%	31.83%	33.42%
≥ 3 Mbps Down	89.05%	88.37%	54.68%	54.61%	31.21%	32.66%
≥ 6 Mbps Down	88.97%	88.29%	54.31%	54.25%	30.75%	32.22%
≥ 10 Mbps Down	88.97%	88.29%	54.31%	54.25%	30.75%	32.22%
Fixed Wireless Technologies	**Population**	**Household**	**Population**	**Household**	**Population**	**Household**
≥ 768 Kbps Down	94.67%	94.39%	75.95%	75.87%	68.24%	68.49%
≥ 3 Mbps Down	61.93%	62.78%	62.86%	61.81%	53.06%	51.36%
≥ 6 Mbps Down	53.69%	54.56%	53.60%	53.40%	44.69%	42.47%
≥ 10 Mbps Down	5.85%	5.85%	12.35%	10.10%	9.49%	7.80%
Mobile Wireless Technologies	**Population**	**Household**	**Population**	**Household**	**Population**	**Household**
≥ 768 Kbps Down	98.83%	98.92%	94.11%	94.91%	90.75%	91.99%
≥ 3 Mbps Down	96.10%	95.41%	80.45%	78.32%	73.50%	71.46%
≥ 6 Mbps Down	93.93%	92.77%	73.74%	71.28%	67.90%	65.33%
≥ 10 Mbps Down	93.91%	92.75%	73.65%	71.18%	67.73%	65.17%
	Population Count	**Household Count**	**Population Count**	**Household Count**	**Population Count**	**Household Count**
Arizona Totals (2010 Census)	6,392,017	2,844,526	1,274,234	601,889	651,358	329,022

Arizona Broadband Coverage Table Notes

See a textual description and analysis of this data in the section below, **Arizona Statewide Digital Landscape and Situational Analysis**.

Data presented in the table above is as collected by the State of Arizona for the NTIA and FCC broadband maps and submitted in Fall 2013 for Broadband Provider (BP) coverage declared as of 06/30/2013. Population across Census Blocks and in proximity to Road Segments are based on calculations utilizing U.S. Census 2010 data.

The Census Bureau identifies two types of urban areas: **Urbanized Areas (UAs)** of 50,000 or more people and **Urban Clusters (UCs)** of at least 2,500 and less than 50,000 people. Per the Census Bureau, **"Rural"** encompasses all population, housing, and territory not included within Urbanized Areas (UAs). For Arizona analysis purposes, **"Sparsely Populated Rural"** encompasses all population, housing, and territory not included within either Urbanized Areas (UA) or Urban Clusters (UC). Using an Urban Area/Cluster GIS Layer, Arizona is calculated to have a total of 241,666 Census Blocks per the 2010 Census of which:

- 86,648 Census Blocks are in Urban Areas (UAs)
- 19,479 Census Blocks are in Urban Clusters (UCs)
- 106,127 Census Blocks total are in Urban Areas (UAs) or Urban Clusters (UCs)
- 155,018 Census Blocks are in Rural areas (Outside UAs only) with a population count of 1,274,234 and household count of 601,889
- 135,539 Census Blocks are in Sparsely Populated Rural areas (Outside both UAs and UCs) with a population count of 651,358 and household count of 329,022

For wireline providers, census blocks greater than 2 square miles intersected by covered road segments were added to their reported list of census blocks less than or equal to 2 sq. mi. For fixed and mobile wireless providers, census block counts were based on census blocks that intersected (were touched by) an overlaying wireless provider's service area. Satellite providers which tend to offer lower downstream and upstream data rates are not included in the Broadband Providers (BPs) for purposes of this analysis. All census blocks, regardless of area or water characteristic were included in this analysis.

Arizona Statewide Digital Landscape and Situational Analysis

From the Arizona Broadband Assessment Project (AZ BAP) data for Fall 2013, we know that a healthy 99.5% of Arizona households can get broadband of at least 768 Kbps download from at least one provider, not including available satellite service. As we move to rural areas that decreases to 97.6% of households. And for sparsely populated rural areas, the percentage decreases further to 95.7% of households, leaving more than 4% of sparsely populated rural households without any broadband coverage at all except satellite.

When we consider the more reasonable modern connection speed of at least 3 Mbps download, the availability percentages start to visibly decline to 97.5% of households statewide, 88.3% for rural areas, and 81.0% for sparsely populated rural areas leaving some 19% of households in sparsely populated rural areas without what we would consider adequate bandwidth. At a somewhat higher connection speed of 6 Mbps download, the availability percentages more precipitously decline to 95.2% of households statewide, 77.8%

for rural areas, and only 65.9% for sparsely populated rural areas leaving some 34% of households in sparsely populated rural areas without such higher performance services.

For the availability of 3 Mbps download from more than a single Broadband Provider, analysis shows that for All Technologies, 97.8% of the statewide population has access to at least one provider, 95.6% access to at least two providers, and 92.3% access to at least three providers. For Arizona's rural areas, 88.8% of the population has access to at least one provider, 78.0% access to at least two providers, and 65.4% access to at least three providers. And for Arizona's sparsely populated rural areas, 81.6% of the population has access to at least one provider, 67.7% access to at least two providers, and 55.2% access to at least three providers.

Looking at specific technologies, DSL, xDSL & other copper delivered services at connection speeds of at least 3 Mbps download are available to 86.4% of households statewide, 55.2% for rural areas, and 43.0% for sparsely populated rural areas. At a somewhat higher connection speed of 6 Mbps download, the availability percentages more precipitously decline to 78.4% of households statewide, 41.0% for rural areas, and only 30.8% for sparsely populated rural areas. The Arizona broadband mapping team has discovered an issue in processing Frontier's DSL coverage and will make corrections in the pending Fall 2013 submittal, likely resulting in reporting of slightly less coverage.

Cable modem services at connection speeds of at least 3 Mbps download are available to 88.7% of households statewide, 55.9% for rural areas, and 34.3% for sparsely populated rural areas. The cable industry has invested heavily in a new generation of DOCSIS 3.0 services to be able to deliver connection speeds of 10 Mbps download or greater to 88.6% of households statewide, but that percentage declines to 55.5% of rural households and only 33.8% of sparsely populated rural households.

Fixed wireless services at connection speeds of at least 768 Kbps download, including Wi-Fi networks and other fixed wireless technologies, are available to 94.7% of individuals statewide, 76.1% for rural areas, and 68.3% for sparsely populated rural areas. At connection speeds of at least 3.0 Mbps, fixed wireless services are available to only 62.0% of individuals statewide, 63.1% of those living in rural areas and 53.2% of those in sparsely populated rural areas.

Mobile wireless services at connection speeds of at least 768 Kbps download, generally 3G services edging into 4G, are available to 98.7% of individuals statewide, 93.7% for rural areas, and 90.2% for sparsely populated rural areas. At connection speeds of at least 3.0 Mbps, well into 4G service range, mobile wireless services have rapidly expanded and are now available to 92.8% of individuals statewide, but only to 68.0% of those living in rural areas and 61.0% of those in sparsely populated rural areas.

Satellite broadband services at connection speeds of at least 1.5 Mbps download are available to all individuals statewide with a view of the southern sky and ability to mount a small satellite dish. Connection speeds of up to 10 Mbps and beyond are available selectively within defined geographic footprints.

Appendix B: Gila County Analysis & Views

	Population
Gila County	**…..53,670**
Globe (County Seat)	**7,471**
Miami	**1,819**
Payson	**15,398**
Star Valley	**2,292**
Unincorporated	**25,684**

Note: Estimates drawn from the July 1, 2013 Population Estimates of the
Office of Employment & Population Statistics, Arizona Department of Administration
http://www.azstats.gov/pubs/demography/July%201_2013%20PopulationEstimates_Final.pdf

Gila County Broadband Overview:

There is very limited DSL coverage in Gila County with only 54.4% of the population able to get DSL at ≥768 Kbps downstream but a very slim 20.5% can get ≥6 Mbps. All population centers have some DSL coverage, but far from complete and there is additional coverage in the southwest portion of the county. The Arizona broadband mapping team has discovered an issue in processing Frontier's DSL coverage and will make corrections in the pending Fall 2013 submittal, likely resulting in reporting of slightly less coverage.

There is somewhat better cable modem coverage in Gila County with 77.4% of the population having available service, consistently at speeds ≥10 Mbps. All population centers have significant cable modem coverage with some peripheral areas unserved and there is no coverage available outside these population centers.

Fixed wireless (licensed and unlicensed) has a more extensive footprint estimated to reach 83.9% of the Gila County population with ≥3 Mbps downstream including all population centers, but there is no available service ≥6 Mbps anywhere in the county.

Mobile wireless in Gila County has a ubiquitous footprint estimated to reach 99.9% of the population at speeds ≥768 Kbps. However, there are virtually no fourth generation (4G) services with speeds ≥3 Mbps downstream available, currently limited to 2.0% of the population and no services anywhere in the county at ≥6 Mbps.

A very small number of Middle Mile points, almost always fiber fed, are available from CenturyLink, and Frontier.

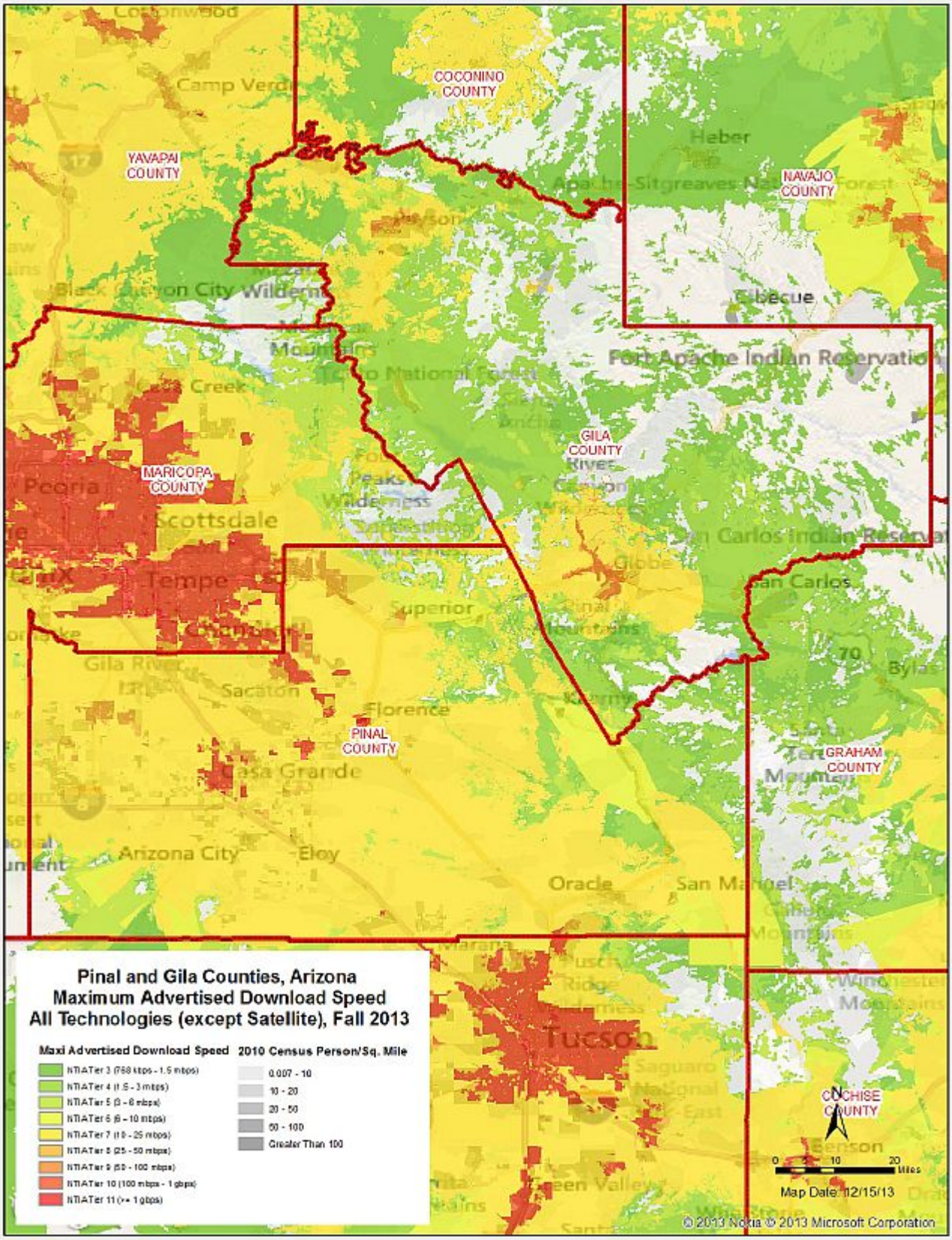
Gila County Zip Code	Mbps Tests	Mbps Download	Mbps Upload
85643	6	1.5	0.5
85552	1	0.2	0.2
85546	2	4.3	0.5

More detailed views of the Prescott area level views to allow for more granular inspection of coverage by technology type across the major population centers.

Gila County Broadband Coverage for Spring 2013

	Gila County		State of Arizona	
All Broadband Tech (Except Satellite)	**Population**	**Household**	**Population**	**Household**
≥ 768 Kbps Down	99.44%	98.79%	99.5%	99.5%
≥ 3 Mbps Down	95.78%	93.60%	97.8%	97.5%
≥ 6 Mbps Down	81.87%	81.77%	95.6%	95.2%
≥ 10 Mbps Down	79.92%	80.32%	95.1%	94.6%
DSL, xDSL & Other Copper Tech	**Population**	**Household**	**Population**	**Household**
≥ 768 Kbps Down	71.59%	68.43%	93.1%	92.8%
≥ 3 Mbps Down	56.93%	54.06%	87.2%	86.4%
≥ 6 Mbps Down	33.41%	37.12%	79.9%	78.4%
≥ 10 Mbps Down	22.62%	27.69%	70.1%	68.4%
Cable Modem Technologies	**Population**	**Household**	**Population**	**Household**
≥ 768 Kbps Down	64.74%	56.62%	89.3%	88.7%
≥ 3 Mbps Down	63.79%	55.40%	89.3%	88.7%
≥ 6 Mbps Down	63.71%	55.34%	89.2%	88.6%
≥ 10 Mbps Down	63.71%	55.34%	89.2%	88.6%
Fixed Wireless Technologies	**Population**	**Household**	**Population**	**Household**
≥ 768 Kbps Down	48.53%	57.10%	94.7%	94.5%
≥ 3 Mbps Down	26.23%	29.02%	62.0%	62.9%
≥ 6 Mbps Down	1.96%	1.46%	34.8%	34.9%
≥ 10 Mbps Down	0.00%	0.00%	5.4%	5.4%
Mobile Wireless Technologies	**Population**	**Household**	**Population**	**Household**
≥ 768 Kbps Down	96.18%	96.55%	98.7%	98.9%
≥ 3 Mbps Down	77.96%	77.75%	92.8%	91.5%
≥ 6 Mbps Down	77.02%	75.35%	87.0%	85.3%
≥ 10 Mbps Down	77.02%	75.35%	86.9%	85.2%
	Population Count	**Household Count**	**Population Count**	**Household Count**
Totals (2010 Census)	**53,597**	**32,698**	**6,392,017**	**2,844,526**

Notes: Data presented in table above is as collected by the State of Arizona for the NTIA and FCC broadband maps and submitted in Fall 2013 for Broadband Provider (BP) coverage declared as of 06/30/2013. Population across Census Blocks and in proximity to Road Segments are based on calculations utilizing U.S. Census 2010 data.


Pinal and Gila Counties, Arizona
Maximum Advertised Download Speed
All Technologies (except Satellite), Fall 2013
Maxi Advertised Download Speed
NTIATier 3 (768 kbps - 1.5 mbps)
NTIATier 4 (1.5 - 3 mbps)
NTIATier 5 (3 - 6 mbps)
NTIATier 6 (6 - 10 mbps)
NTIATier 7 (10 - 25 mbps)
NTIATier 8 (25 - 50 mbps)
NTIATier 9 (50 - 100 mbps)
NTIATier 10 (100 mbps - 1 gbps)
NTIATier 11 (>= 1 gbps)
2010 Census Person/Sq. Mile
0.007 - 10
10 - 20
20 - 50
50 - 100
Greater Than 100
COCONINO COUNTY
YAVAPAI COUNTY
NAVAJO COUNTY
MARICOPA COUNTY
GILA COUNTY
PINAL COUNTY
GRAHAM COUNTY
COCHISE COUNTY
Camp Verde
Heber
Cibecue
Fort Apache Indian Reservation
Peoria
Scottsdale
Tempe
Superior
Sacaton
Florence
Casa Grande
Arizona City
Eloy
Oracle
San Manuel
Tucson
Bylas
Miles
Map Date: 12/15/13
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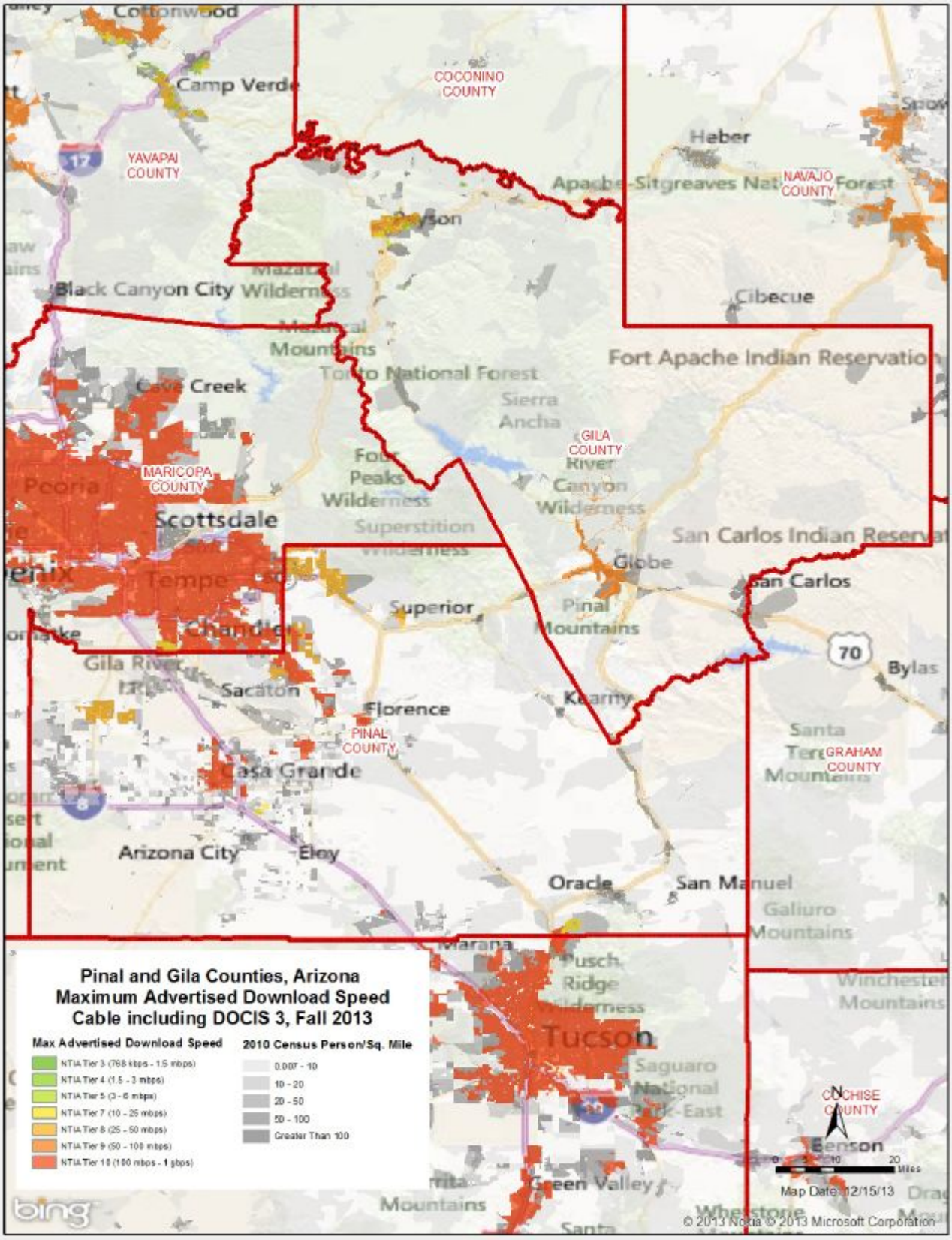
Pinal and Gila Counties, Arizona
Maximum Advertised Download Speed
Cable including DOCIS 3, Fall 2013
Max Advertised Download Speed
NTIA Tier 3 (768 kbps - 1.5 mbps)
NTIA Tier 4 (1.5 - 3 mbps)
NTIA Tier 5 (3 - 6 mbps)
NTIA Tier 7 (10 - 25 mbps)
NTIA Tier 8 (25 - 50 mbps)
NTIA Tier 9 (50 - 100 mbps)
NTIA Tier 10 (100 mbps - 1 gbps)
2010 Census Person/Sq. Mile
0.007 - 10
10 - 20
20 - 50
50 - 100
Greater Than 100
COCONINO COUNTY
YAVAPAI COUNTY
NAVAJO COUNTY
MARICOPA COUNTY
GILA COUNTY
PINAL COUNTY
GRAHAM COUNTY
COCHISE COUNTY
Camp Verde
Heber
Cibecue
Black Canyon City
Cave Creek
Fort Apache Indian Reservation
Scottsdale
Tempe
Superior
Globe
San Carlos
Florence
Casa Grande
Arizona City
Eloy
Oracle
San Manuel
Tucson
Benson
Green Valley
Map Date: 12/15/13
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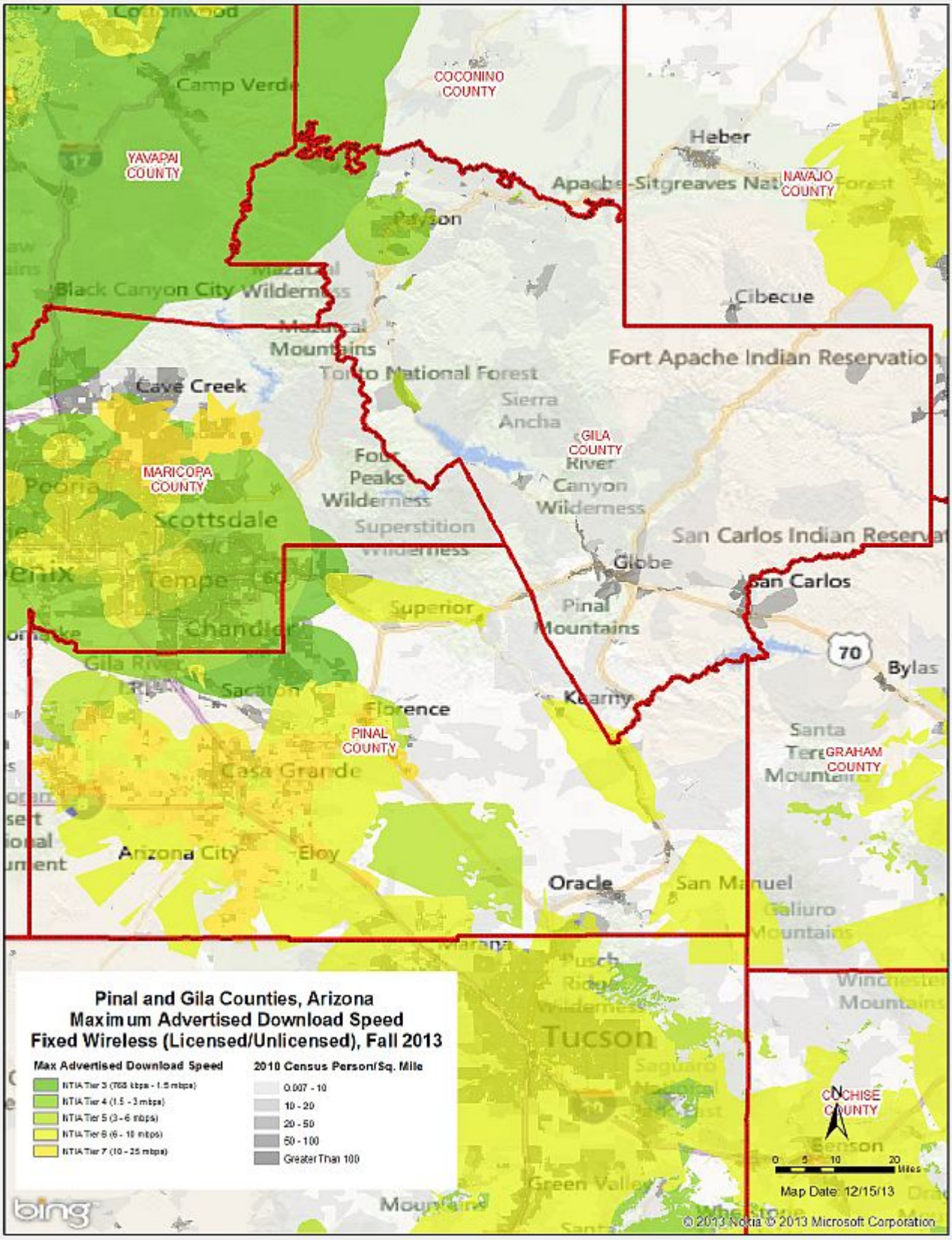
Pinal and Gila Counties, Arizona
Maximum Advertised Download Speed
Fixed Wireless (Licensed/Unlicensed), Fall 2013
Max Advertised Download Speed
NTIA Tier 3 (768 kbps - 1.5 mbps)
NTIA Tier 4 (1.5 - 3 mbps)
NTIA Tier 5 (3 - 6 mbps)
NTIA Tier 6 (6 - 10 mbps)
NTIA Tier 7 (10 - 25 mbps)
2010 Census Person/Sq. Mile
0.007 - 10
10 - 20
20 - 50
50 - 100
Greater Than 100
COCONINO COUNTY
YAVAPAI COUNTY
NAVAJO COUNTY
MARICOPA COUNTY
GILA COUNTY
PINAL COUNTY
GRAHAM COUNTY
COCHISE COUNTY
Camp Verde
Heber
Payson
Cibecue
Black Canyon City
Fort Apache Indian Reservation
Cave Creek
Sierra Ancha
Four Peaks Wilderness
Canyon Wilderness
Superstition Wilderness
Scottsdale
Tempe
Chandler
Globe
San Carlos
Superior
Pinal Mountains
Bylas
Kearny
Florence
Casa Grande
Arizona City
Eloy
Oracle
San Manuel
Tucson
Green Valley
Map Date: 12/15/13
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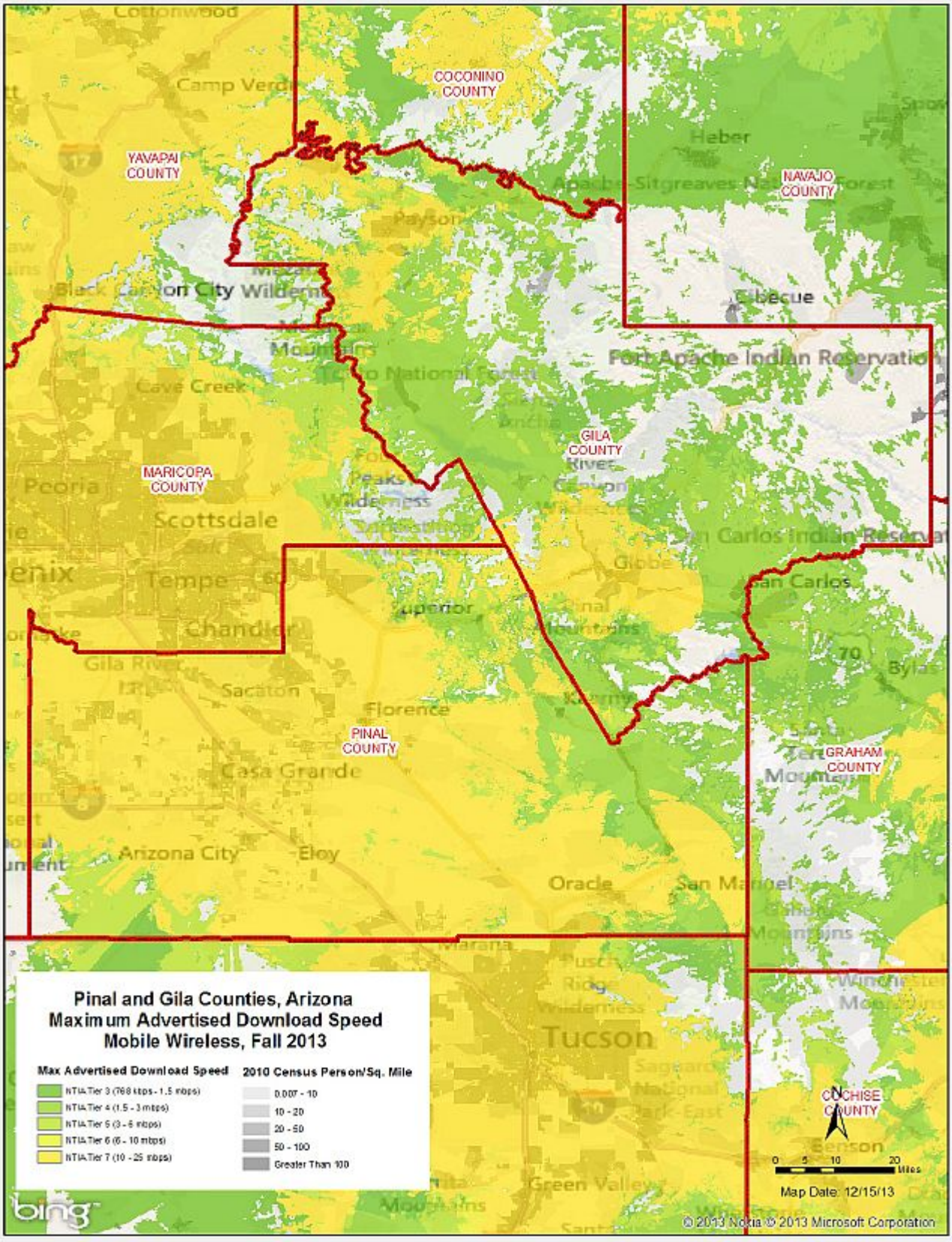
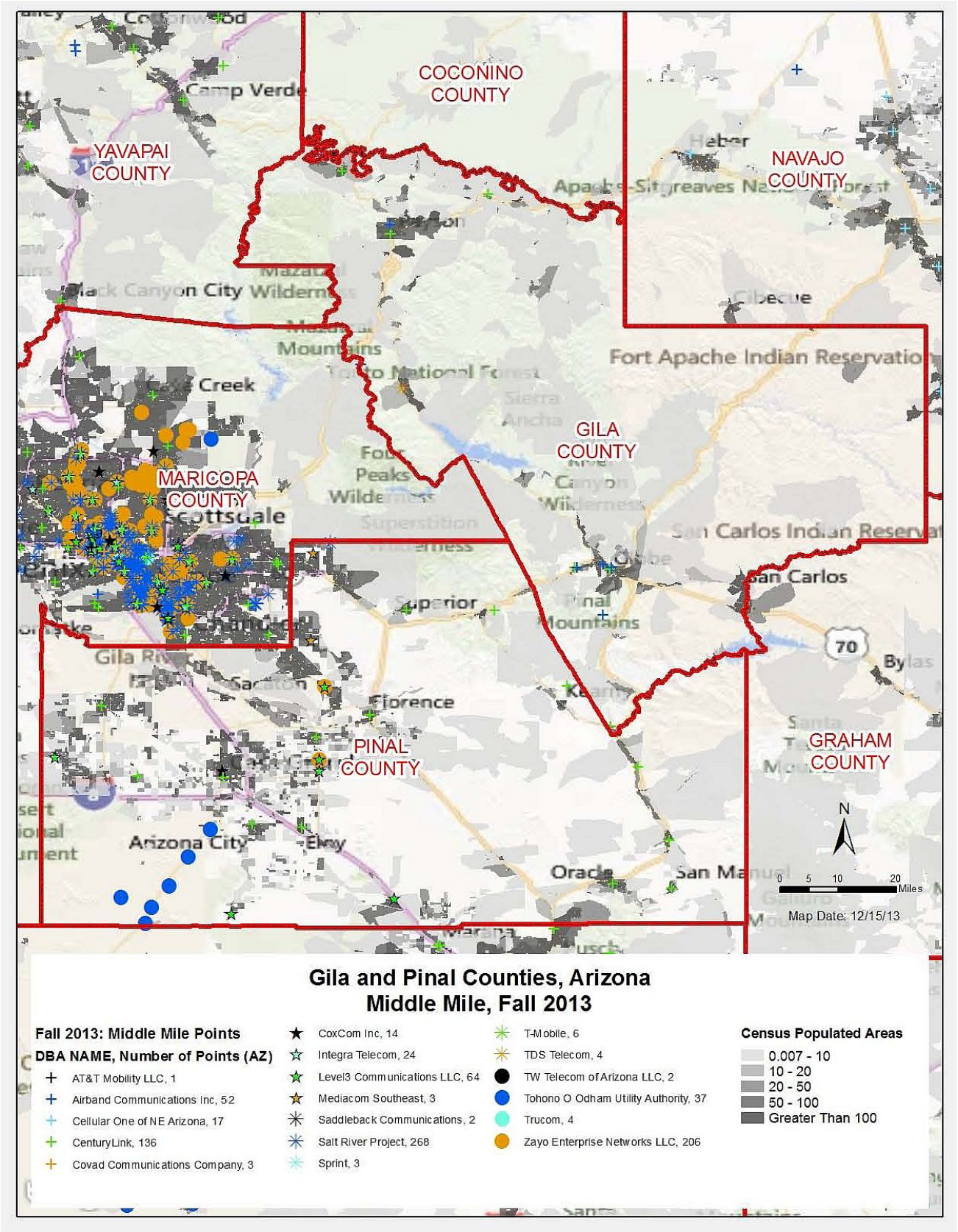

COCONINO COUNTY
YAVAPAI COUNTY
NAVAJO COUNTY
GILA COUNTY
MARICOPA COUNTY
PINAL COUNTY
GRAHAM COUNTY
COCHISE COUNTY
Pinal and Gila Counties, Arizona
Maximum Advertised Download Speed
Mobile Wireless, Fall 2013
Max Advertised Download Speed
NTIA Tier 3 (768 kbps - 1.5 mbps)
NTIA Tier 4 (1.5 - 3 mbps)
NTIA Tier 5 (3 - 6 mbps)
NTIA Tier 6 (6 - 10 mbps)
NTIA Tier 7 (10 - 25 mbps)
2010 Census Person/Sq. Mile
0.007 - 10
10 - 20
20 - 50
50 - 100
Greater Than 100
0 5 10 20 Miles
Map Date: 12/15/13
© 2013 Nokia © 2013 Microsoft Corporation


COCONINO COUNTY
YAVAPAI COUNTY
NAVAJO COUNTY
GILA COUNTY
MARICOPA COUNTY
PINAL COUNTY
GRAHAM COUNTY
Camp Verde
Heber
Fort Apache Indian Reservation
Four Peaks Wilderness
Superstition Wilderness
San Carlos Indian Reservation
San Carlos
Superior
Pinal Mountains
Florence
Arizona City
Oracle
Bylas
70
N
0 5 10 20 Miles
Map Date: 12/15/13
Gila and Pinal Counties, Arizona
Middle Mile, Fall 2013
Fall 2013: Middle Mile Points
DBA NAME, Number of Points (AZ)
AT&T Mobility LLC, 1
Airband Communications Inc, 52
Cellular One of NE Arizona, 17
CenturyLink, 136
Covad Communications Company, 3
CoxCom Inc, 14
Integra Telecom, 24
Level3 Communications LLC, 64
Mediacom Southeast, 3
Saddleback Communications, 2
Salt River Project, 268
Sprint, 3
T-Mobile, 6
TDS Telecom, 4
TW Telecom of Arizona LLC, 2
Tohono O Odham Utility Authority, 37
Trucom, 4
Zayo Enterprise Networks LLC, 206
Census Populated Areas
0.007 - 10
10 - 20
20 - 50
50 - 100
Greater Than 100

Appendix C: Pinal County Analysis and Views

Pinal County Broadband Analysis

	Population
Pinal	**393,813**
Apache Junction	**37,325**
Casa Grande	**50,938**
Coolidge	**12,120**
Florence (County Seat)	**25,512**
Kearny	**1,991**
Mammoth	**1,460**
Maricopa	**46,140**
Superior	**2,895**
Unincorporated	**197,950**

Note: Estimates drawn from the July 1, 2013 Population Estimates of the Office of Employment & Population Statistics, Arizona Department of Administration
http://www.azstats.gov/pubs/demography/July%201_2013%20PopulationEstimates_Final.pdf

Pinal County Broadband Overview:

There is very limited DSL coverage in Pinal County only 54.4% of the population able to get DSL at ≥768 Kbps downstream but a very slim 20.5% can get ≥6 Mbps. All population centers have some DSL coverage, but far from complete and there is additional coverage in the southwest portion of the county. The Arizona broadband mapping team has discovered an issue in processing Frontier's DSL coverage and will make corrections in the pending Fall 2013 submittal, likely resulting in reporting of slightly less coverage.

There is somewhat better cable modem coverage in Pinal County with 77.4% of the population having available service, consistently at speeds ≥10 Mbps. All population centers have significant cable modem coverage with some peripheral areas unserved and there is no coverage available outside these population centers.

Fixed wireless (licensed and unlicensed) has a more extensive footprint estimated to reach 83.9% of the Pinal County population with ≥3 Mbps downstream including all population centers, but there is no available service ≥6 Mbps anywhere in the county.

Mobile wireless in Pinal County has a ubiquitous footprint estimated to reach 99.9% of the population at speeds ≥768 Kbps. However, there are virtually no fourth generation (4G) services with speeds ≥3 Mbps downstream available, currently limited to 2.0% of the population and no services anywhere in the county at ≥6 Mbps. A very small number of Middle Mile points, almost always fiber fed, are available from CenturyLink, and Frontier.

Pinal County Zip Code	Mbps Tests	Mbps Download	Mbps Upload
85643	6	1.5	0.5
85552	1	0.2	0.2
85546	2	4.3	0.5

More detailed views of the Ash Fork area level views to allow for more granular inspection of coverage by technology type across the major population centers.

Pinal County Broadband Coverage for Spring 2013

	Pinal County		State of Arizona	
All Broadband Tech (Except Satellite)	**Population**	**Household**	**Population**	**Household**
≥ 768 Kbps Down	99.99%	99.99%	99.5%	99.5%
≥ 3 Mbps Down	99.93%	99.90%	97.8%	97.5%
≥ 6 Mbps Down	99.82%	99.79%	95.6%	95.2%
≥ 10 Mbps Down	98.01%	97.74%	95.1%	94.6%
DSL, xDSL & Other Copper Tech	**Population**	**Household**	**Population**	**Household**
≥ 768 Kbps Down	81.43%	84.52%	93.1%	92.8%
≥ 3 Mbps Down	75.51%	74.76%	87.2%	86.4%
≥ 6 Mbps Down	73.33%	72.49%	79.9%	78.4%
≥ 10 Mbps Down	61.08%	62.50%	70.1%	68.4%
Cable Modem Technologies	**Population**	**Household**	**Population**	**Household**
≥ 768 Kbps Down	71.50%	70.18%	89.3%	88.7%
≥ 3 Mbps Down	71.50%	70.18%	89.3%	88.7%
≥ 6 Mbps Down	71.50%	70.18%	89.2%	88.6%
≥ 10 Mbps Down	71.50%	70.18%	89.2%	88.6%
Fixed Wireless Technologies	**Population**	**Household**	**Population**	**Household**
≥ 768 Kbps Down	96.78%	96.82%	94.7%	94.5%
≥ 3 Mbps Down	61.10%	58.92%	62.0%	62.9%
≥ 6 Mbps Down	58.68%	56.58%	34.8%	34.9%
≥ 10 Mbps Down	41.27%	38.11%	5.4%	5.4%
Mobile Wireless Technologies	**Population**	**Household**	**Population**	**Household**
≥ 768 Kbps Down	99.99%	99.98%	98.7%	98.9%
≥ 3 Mbps Down	97.53%	97.13%	92.8%	91.5%
≥ 6 Mbps Down	97.41%	96.95%	87.0%	85.3%
≥ 10 Mbps Down	97.41%	96.95%	86.9%	85.2%
	Population Count	**Household Count**	**Population Count**	**Household Count**
Totals (2010 Census)	**375,770**	**159,222**	**6,392,017**	**2,844,526**

Notes: Data presented in table above is as collected by the State of Arizona for the NTIA and FCC broadband maps and submitted in Fall 2013 for Broadband Provider (BP) coverage declared as of 06/30/2013. Population across Census Blocks and in proximity to Road Segments are based on calculations utilizing U.S. Census 2010 data.

Pinal County Selected Demographics

Baseline Demographics	Pinal County	State of Arizona
County seat/State capitol	Florence	Phoenix
Land area in square miles	5,365.61	113,594.08
Population, 2012 estimate	387,020	6,553,255
Population, percent change, 4/1/10-7/1/12	3.0%	2.5%
Persons under 18 years, percent, 2012	25.4%	24.7%
Persons 65 years and over, percent, 2012	15.9%	14.8%
Persons per household, 2007-2011	2.80	2.64
Persons per square mile, 2010	70	56.3
High school graduate or higher, percent of persons age 25+, 2007-2011	84.2%	85.2%
Bachelor's degree or higher, percent of persons age 25+, 2007-2011	18.3%	26.4%
Per capita income in the past 12 months (2011 dollars), 2007-2011	$ 20,901	$25,784
Median household income, 2007-2011	$ 50,164	$50,752
Persons below poverty level, percent, 2007-2011	15.2%	16.2%
Homeownership rate, 2007-2011	76.2%	66.6%
Total civilian labor force, 12/13	139,331	3,017,815
Total employment, 12/13	128,854	2,766,640
Total unemployment, 12/13	10,477	251,175
Unemployment rate, 12/13	7.5%	8.3%

Employment by Category (December 2013 Estimates)	Pinal County by Population	Statewide by Population	Pinal County %	Statewide %
Total Nonfarm	18,050	2,453,900	100.0%	100.0%
Total Private Employment	7,500	2,088,300	41.5%	85.1%
Goods Producing	775	296,200	4.3%	12.1%
Mining and Construction	-	139,400	-	5.7%
Manufacturing	-	156,800	-	6.4%
Service-Providing	17,275	2,157,700	95.7%	87.9%
Private Service-Providing	6,850	1,792,100	37.9%	73.0%
Trade, Transportation & Utilities	1.925	482,600	10.6%	19.7%
Information	-	39,600	-	1.6%
Financial Activities	-	183,200	-	7.5%
Professional & Business Services	-	360,500	-	14.7%
Educational & Health Services	-	369,700	-	15.1%
Leisure and Hospitality	-	272,100	-	11.1%
Other Private Services	4,925	84,400	27.3%	3.4%
Government	10,425	365,600	57.7%	14.9%
Federal Government	2,575	55,700	14.3%	2.3%
State & Local Government	7,850	309,900	43.5%	12.6%

Sources: U.S. Census Bureau State & County QuickFacts (http://quickfacts.census.gov/) and ADOA Office of Employment & Population Statistics (http://www.workforce.az.gov/). For employment by category estimates, farm employment, private household employment, and self-employment are excluded and all employment statistics are non-seasonally adjusted.

Central Arizona Council of Governments (CAG)

Broadband Coverage Update for Fall 2013

GILA & PINAL Counties Broadband Coverage for Fall 2013

	Pinal County	Gila County	State of Arizona			
All Broadband Tech (Except Satellite)	**Population**	**Household**	**Population**	**Household**	**Population**	**Household**
≥ 768 Kbps Down	99.99%	99.99%	99.44%	98.79%	99.55%	99.54%
≥ 3 Mbps Down	99.93%	99.90%	95.78%	93.60%	98.54%	98.34%
≥ 6 Mbps Down	99.82%	99.79%	81.87%	81.77%	97.88%	97.72%
≥ 10 Mbps Down	98.01%	97.74%	79.92%	80.32%	96.92%	96.58%
DSL, xDSL & Other Copper Tech	**Population**	**Household**	**Population**	**Household**	**Population**	**Household**
≥ 768 Kbps Down	81.43%	84.52%	71.59%	68.43%	93.60%	93.23%
≥ 3 Mbps Down	75.51%	74.76%	56.93%	54.06%	88.16%	87.31%
≥ 6 Mbps Down	73.33%	72.49%	33.41%	37.12%	81.51%	80.14%
≥ 10 Mbps Down	61.08%	62.50%	22.62%	27.69%	72.14%	70.55%
Cable Modem Technologies	**Population**	**Household**	**Population**	**Household**	**Population**	**Household**
≥ 768 Kbps Down	71.50%	70.18%	64.74%	56.62%	89.27%	88.62%
≥ 3 Mbps Down	71.50%	70.18%	63.79%	55.40%	89.05%	88.37%
≥ 6 Mbps Down	71.50%	70.18%	63.71%	55.34%	88.97%	88.29%
≥ 10 Mbps Down	71.50%	70.18%	63.71%	55.34%	88.97%	88.29%
Fixed Wireless Technologies	**Population**	**Household**	**Population**	**Household**	**Population**	**Household**
≥ 768 Kbps Down	96.78%	96.82%	48.53%	57.10%	94.67%	94.39%
≥ 3 Mbps Down	61.10%	58.92%	26.23%	29.02%	61.93%	62.78%
≥ 6 Mbps Down	58.68%	56.58%	1.96%	1.46%	53.69%	54.56%
≥ 10 Mbps Down	41.27%	38.11%	0.00%	0.00%	5.85%	5.85%
Mobile Wireless Technologies	**Population**	**Household**	**Population**	**Household**	**Population**	**Household**
≥ 768 Kbps Down	99.99%	99.98%	96.18%	96.55%	98.83%	98.92%
≥ 3 Mbps Down	97.53%	97.13%	77.96%	77.75%	96.10%	95.41%
≥ 6 Mbps Down	97.41%	96.95%	77.02%	75.35%	93.93%	92.77%
≥ 10 Mbps Down	97.41%	96.95%	77.02%	75.35%	93.91%	92.75%
	Population Count	**Household Count**	**Population Count**	**Household Count**	**Population Count**	**Household Count**
County Totals (2010 Census)	**375,770**	**159,222**	**53,597**	**32,698**	**6,392,017**	**2,844,526**

Notes: Data presented in table above is as collected by the State of Arizona for the NTIA and FCC broadband maps and submitted in Fall 2013 for Broadband Provider (BP) coverage declared as of 6/30/13. Population across Census Blocks and in proximity to Road Segments are based on calculations utilizing U.S. Census 2010 data.

Appendix D: Central Arizona Broadband Providers

Company Name	Company Website	Contact Name	Contact Telephone	Contact Email
Airespring	www.airespring.com	Sales	818-786-8990	sales@airespring.com
AT&T	www.att.com	Gary Sima	602-670-9200	gary.sima@att.com
BeamSpeed	www.beamspeed.com	Sales	928-343-0300	sales@beamspeed.com
Bolt Internet	www.boltinternet.com	Sales	928-717-2658	sales@boltinternet.com
Bullseye Telecom	www.bullseyetelecom.com	John Dwyer	877-438-2855	sales@bullseyetelecom.com
Cable One	www.cableone.net	Aldo Casartelli	928-445-4511	aldo.casartelli@cableone.biz
CenturyLink	www.centurylink.com	David Dameron	520-861-0322	david.dameron@centurylink.com
CIS Wireless Broadband	www.cis-broadband.com	Steve Clark	520-458-0293	stclark@clarkinfosys.com
CITYNET	www.citynet.net	Sales	800-881-2638	info@citynet.net
Comcast Cable	www.business.comcast.com	Sales	855-639-2975	businesshelp@comcast.com
CommSpeed	www.commspeed.net	Sales	928-233-1111	info@comspeed.net
Cox Arizona Telecom	www.cox.com	David Daniels	866-701-8737	daviddaniels177@yahoo.com
Floor 13 Access	www.floor13access.com	Marty Schwarzkopf	602-920-3291	marty@floor13access.com
Freeway Networks		Nick Wold	602-692-4182	bnwold@gmail.com
Frontier Communications	www.frontier.com	Mark Jeffries	928-537-6660	Mark.Jeffries@ftr.com
GovNet	www.govnet.net	Pat Barringer	480-424-1410	pat.b@govnet.net
Granite Telecomunications	www.granitenet.com	Sales	866-205-8928	custserv@granitenet.com
Greenfield Communications	www.egreenfield.com	Sales	888-230-0020	sales@egreenfield.com
GSWTelecom	www.gswtelecom.com	Andy Wieser	520-733-4142	andy.wieser@gswtelecom.com
HP-AZ.net	www.HPAZ.net	Curt Vincent	520-732-2208	sales@hpaz.net

InfoWest	www.infowest.com	Sales	435-674-0165	info@infowest.com
Integra Telecom	www.integratelecom.com	Chip Gorsuch	877-953-7747	chip.gorsuch@integratelecom.com
Last Mile Research	www.lastmileresearch.com	Sales	415-462-1775	sales@lastmileresearch.com
Logicalis	www.us.logicalis.com	Brian Arland	602-369-7409	brianarland@us.logicalis.com
MegaPath	www.megapath.com	Sales	480-467-3237	sales@megapath.com
MTE Telecom	www.mtecom.net	Sales	800-462-4523	info@mtecom.net
NI Solutions	www.nisolution.com	Irshad Ansari	317-616-3301	iansari@nisolution.com
Red Rock Telecom		Jack Pleiter	480-745-7902	jack@redrocktelecom.com
RuralNet Wireless	www.ruralnetwireless.com	Bob Enyeart	866-446-5882	mail4liberty@yahoo.com
San Carlos Apache Telecom-munications Utility, Inc.	www.scatui.com	Sales	928-475-2433	marketing@scatui.com
Schurz Communications	www.schurz.com	Sales	574-247-7237	info@schurz.com
Simply Bits	www.simplybits.com	Sales	520-545-0400	sales@simplybits.com
Simply the BeSST		Travis Foster	602-295-7305	travis@stbaz.com
Sprocket Communications	www.sprocketcommunications.com	Sales	520-740-9700	info@getsprocket.net
SRP Telecom	www.srpnet.com	Jeff Taylor	602-236-8777	wireline@srpnet.com
Suddenlink	www.suddenlink.com	Glen Clark	888-753-1542	glen.clark@suddenlink.com
Table Top Telephone Co.	www.tabletoptelephone.com	Sales	520-387-5600	genofc@tabletoptelephone.com
TDS Telecom	www.tdstelecom.com	Sales	866-448-0071	bizcenter@tdstelecom.com
Transcend Broadband	www.transcendbroadband.net	Sales	520-413-4861	info@transcendbroadband.com
Transworld Network	www.twncorp.com	Keith Martin	800-253-0665	kmartin@twncorp.com
tw telecom	www.twtelecom.com	Brenda Beall	602-574-2937	brenoffire@gmail.com
UNSi.net	www.unsi.net	Sales	855-888-8674	info@unsi.net
USA Digital Communications	www.usad.com	Sales	888-872-3787	info@usad.com

Valley Telecom	www.vtc.net	Mike Fortenberry	520-507-7883	mike.fortenberry@vtc.net
Venicom	www.venicom.com	Ed Parker	602-370-4225	ed.parker@venicom.com
Webhiway Communications	www.webhiway.com	John	520-612-6125	john@webhiway.com
Windstream	www.windstreambusiness.com	Steve Godsey	602-429-3442	Steven.Godsey@windstream.com
WydeBeam	www.wydebeam.com	Sales	480-964-4749	sales@wydebeam.com
XO Communications	www.xo.com	Sales	800-815-6223	Web fill-in form
Zayo Enterprise Networks	www.zayo.com	Sales	866-364-6033	sales@zayo.com
Zona Communications	www.zonacommunications.com	Sales	623-455-4555	customerservice@teamzona.com

Appendix E: Development Grants and Resources

The Digital Arizona Program (DAP) provides a deep well of resources and tools for helping your community develop high-speed broadband access.

One such resource that DAP has published is a grant (and other resources) guide. It is in PDF format and available at this link
http://digitalarizona.gov/Resources/Arizona_Rural_Initiatives.html

The PDF document available at that link covers grant opportunities

- at almost a dozen Arizona government agencies
- at five federal government agencies
- under three federal programs
- and that are sometimes specific to telehealth, libraries, public safety and other institutions that anchor rural communities

The Grants and Resources Guide available at the link above also notes other broadband grant opportunities from Arizona-specific trusts and foundations, national foundations, and community investment opportunities from companies and communities.

The broadband resources section of the document includes links to studies, guides, reports, and more from various government, private, and non-profit entities.

The document will also guide you to web links related to:

- Arizona Strategic Enterprise Technology Office
- Arizona Corporation Commission
- Arizona State Land Department
- Arizona Department of Education
- Arizona Small Business Develop Centers
- ...many more

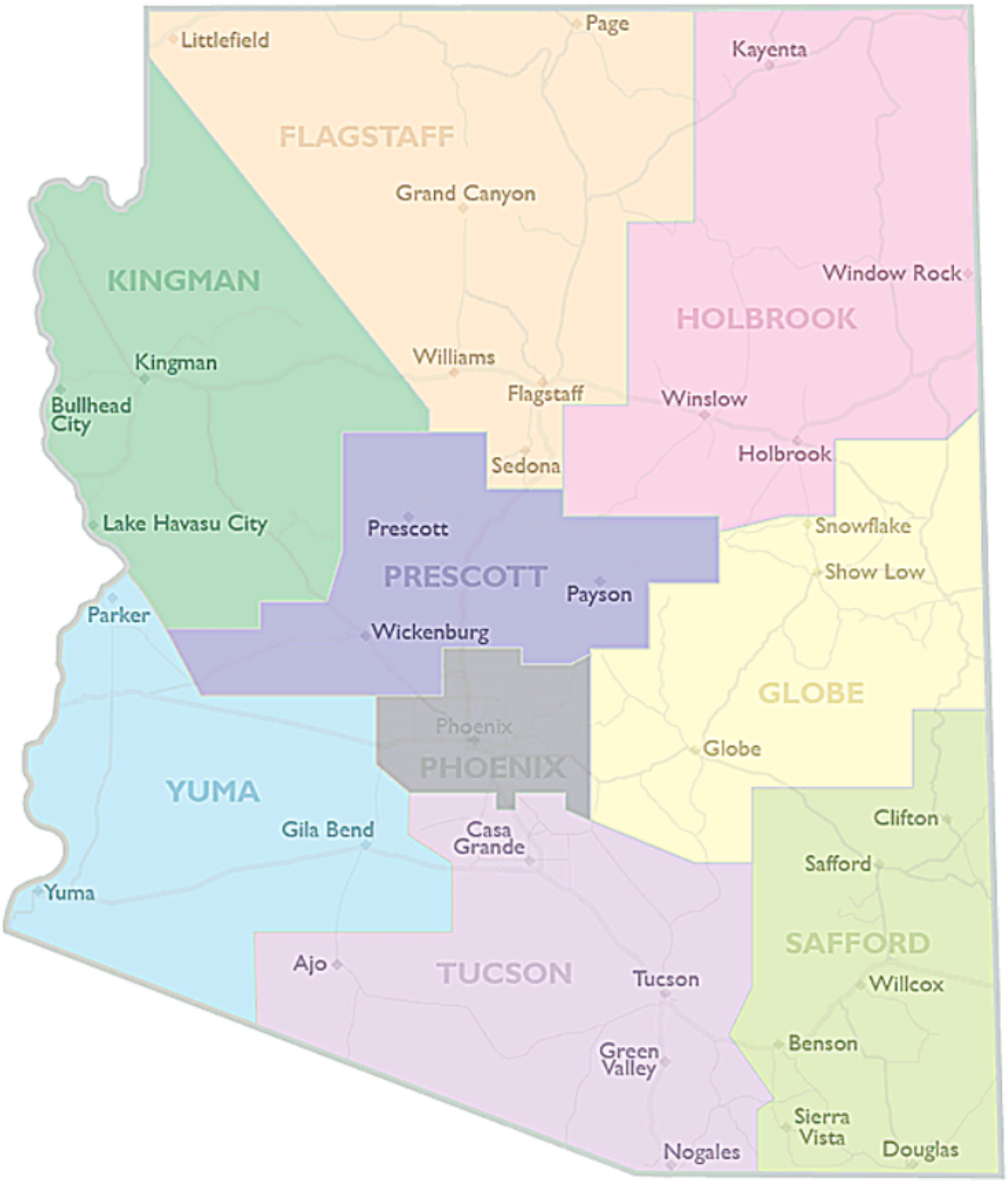
Appendix F: Arizona Transportation and Other Public Infrastructure

Arizona Department of Transportation (ADOT):

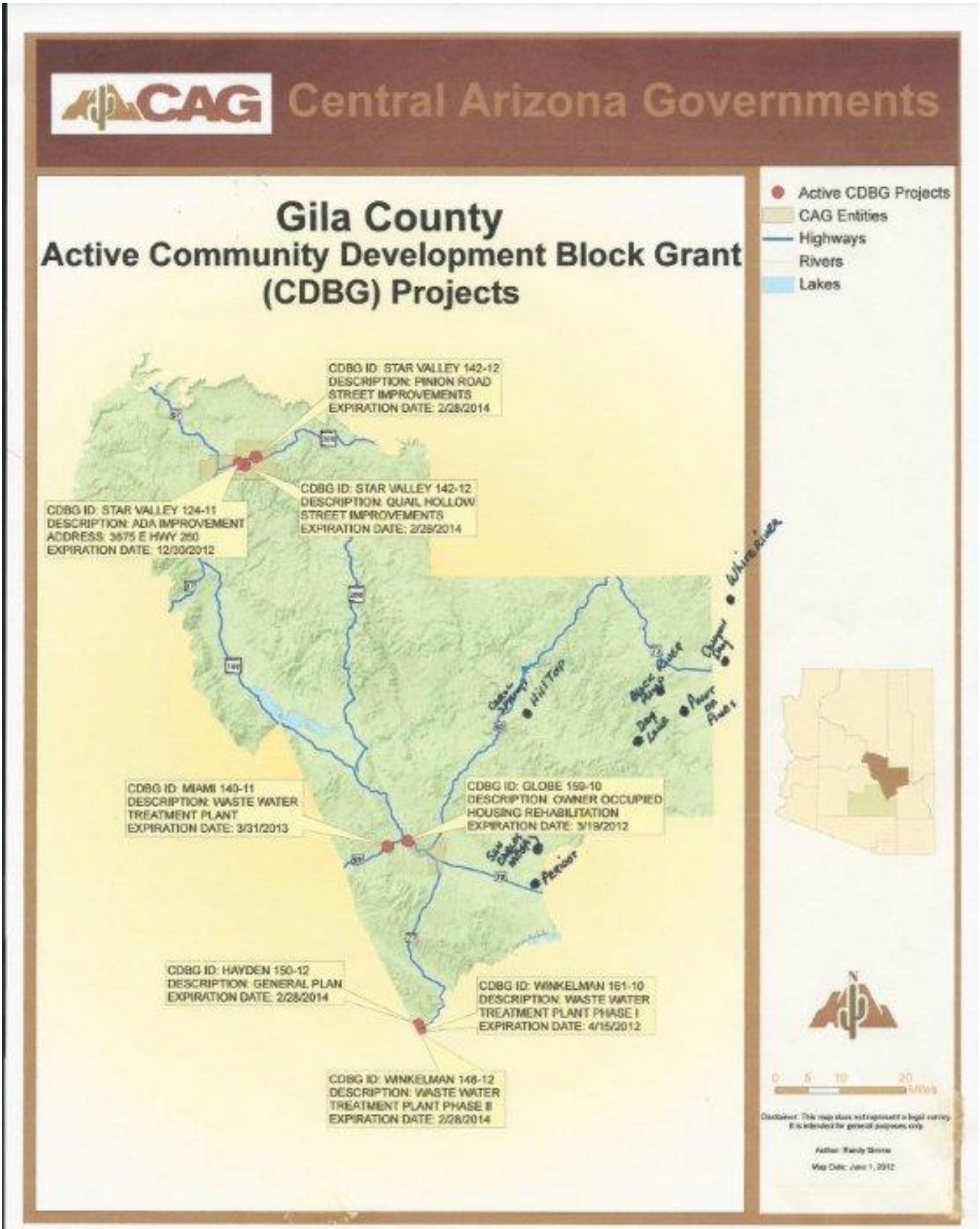
The Arizona Department of Transportation (ADOT) is a multi-modal transportation agency serving one of the fastest growing areas of the country. ADOT is responsible for planning, building and operating a complex highway system in addition to building and maintaining bridges and the Grand Canyon Airport. ADOT is funded by individuals and businesses through fuel taxes, motor carrier fees, vehicle title, registration, and license fees to build and operate the State's transportation systems. Statewide projects are managed by their district offices. The map below shows how ADOT Engineering and Maintenance Districts are defined.

ADOT Engineering and Maintenance Districts

- Flagstaff District
- Globe District
- Holbrook District
- Kingman District
- Phoenix District
- Prescott District
- Safford District
- Tucson District
- Yuma District



Arizona Railroads
(Service Status and Ownership)


CAG
Central Arizona Governments
Gila County
Active Community Development Block Grant
(CDBG) Projects
Active CDBG Projects
CAG Entities
Highways
Rivers
Lakes
CDBG ID: STAR VALLEY 142-12
DESCRIPTION: PINION ROAD
STREET IMPROVEMENTS
EXPIRATION DATE: 2/28/2014
CDBG ID: STAR VALLEY 142-12
DESCRIPTION: QUAIL HOLLOW
STREET IMPROVEMENTS
EXPIRATION DATE: 2/28/2014
CDBG ID: STAR VALLEY 124-11
DESCRIPTION: ADA IMPROVEMENT
ADDRESS: 3675 E HWY 260
EXPIRATION DATE: 12/30/2012
CDBG ID: MIAMI 140-11
DESCRIPTION: WASTE WATER
TREATMENT PLANT
EXPIRATION DATE: 3/31/2013
CDBG ID: GLOBE 159-10
DESCRIPTION: OWNER OCCUPIED
HOUSING REHABILITATION
EXPIRATION DATE: 3/19/2012
CDBG ID: HAYDEN 150-12
DESCRIPTION: GENERAL PLAN
EXPIRATION DATE: 2/28/2014
CDBG ID: WINKELMAN 161-10
DESCRIPTION: WASTE WATER
TREATMENT PLANT PHASE I
EXPIRATION DATE: 4/15/2012
CDBG ID: WINKELMAN 148-12
DESCRIPTION: WASTE WATER
TREATMENT PLANT PHASE II
EXPIRATION DATE: 2/28/2014
Hilltop
Payson
N
0 5 10 20
Miles

Appendix G: Broadband Request for Information (RFI) Example

Introduction

The State of Arizona, Department of Administration and Governor's Office of Education Innovation, is seeking technical input and recommendations to expand Internet connectivity to Arizona schools that do not have enough Internet capacity to successfully conduct online assessments of their students in 2015. This is an essential priority to meet the increasing high speed and high capacity broadband demands of education throughout the state. This Request for Information is based on our expectation that Arizona telecommunications providers can think creatively and innovatively to simultaneously transform education and invest in our state's network infrastructure.

To fully maximize opportunities created by expanded network capacity, Arizona schools should work collaboratively with public libraries and higher education institutions. Improving Internet connectivity in public schools would provide significant advantages to community colleges, universities, and libraries.

The Internet connections that are proposed must be secure, affordable, redundant, resilient and scalable. The connections should leverage existing assets owned by private or public entities in Arizona that are eligible to participate in the federal E-Rate program. Vendors are encouraged to focus on leveraging recent advancements in network technologies and network components already in place throughout the state, in order to establish a robust broadband communication infrastructure sufficient to meet the increasing demands of public schools in the State.

The purpose of this RFI is to identify broadband scenarios along with innovative pricing models. This process will allow the Department of Administration and Governor's Office of Education Innovation to understand the vision of Arizona telecommunications providers for increasing Internet capacity at Arizona public schools to meet immediate and longer-term future Internet capacity needs. Vendors are encouraged to utilize current, emerging, and next-generation technology as well as alternative last-mile solutions to propose optimal network connections.

Submitting a Response

Interested vendors should submit answers to the questions in Section IV and any additional material necessary for reviewers to understand the response. The State is not interested in receiving elaborate promotional or advertising material; such materials will not be reviewed or considered. Respondents are solely responsible for all expenses associated with responding to this RFI.

Background

Currently, Internet connections to Arizona public schools are provided through a bidding process managed by local school administrators. Consequently, there is great variability in the speed and capacity of Internet connections that are installed by independent telecommunications providers. Some connections are high capacity, high speed fiber that is sufficient to support instructional, assessment, administrative, and training requirements for students, staff, and teachers. Other schools lack funding and IT staff support to contract and pay for adequate connectivity. These locally-managed projects can result in network and IT silos that are redundant and repetitive, and the cost of the connections may be higher than they would be if a state-wide purchasing process were used.

The Governor's Office of Education Innovation is overseeing a statewide data collection and interviewing project that includes all Arizona public schools. This activity will be completed in September. It will show what current network capabilities are at each school in all districts, how much more capacity is needed, and the portion of the cost that will be covered by E-Rate.

The current need to expand network capacity at many Arizona schools also creates an opportunity to consider state-wide approaches to design, install and manage this project in ways that may take advantage of existing backbone and middle mile network infrastructure. The AZNet system provides an excellent example of an effective and efficient state-managed network. It is managed by the Department of Administration to provide network connections to state agencies and employees throughout the state. A single contractor manages the entire network and only 8 state employees oversee the system. Another state-wide approach is an education partnership-managed network found in many states. In these networks, the central campuses of higher education institutions are typically the hubs of backbone network rings, and public education administrative facilities and schools link to the hubs with robust middle and last mile fiber connections.

This RFI is intended to accomplish the following goals and objectives:

- Communicate to vendors the need in many Arizona schools for higher speed, higher capacity Internet connections. Later this year, the statewide data collection project will provide interested telecomm vendors with the capacity, speed, and security capability of Internet connections at all schools.
- Provide opportunities for vendors to suggest statewide or regional approaches similar to the AzNet state network or an educational network partnership that could utilize and expand existing backbone and middle-mile infrastructure.
- Propose connectivity to the Sun Corridor Terapop and/or existing University networks in Tucson, Phoenix, or Flagstaff.
- Learn from vendors what technical and networking options are available, with an emphasis on creative approaches that will provide growing bandwidth capacity at public schools and improved security levels, at lower prices.
- Solicit informational pricing to assist the state in formulating future budget requests.
- Give vendors the opportunity to provide strategic planning recommendations which accommodate increasing bandwidth requirements.
- Give vendors the opportunity to address how to leverage existing assets owned by private or public telecomm providers that are eligible to participate in the federal E-Rate program.

Questions

For all questions, provide a clear and concise response. Include illustrative examples where appropriate.

Company Information

Company Information	Response
Company name **Company address** **Parent company** **Describe ownership and/or strategic partnerships of your company**	
Name and signature of the person responsible for the information contained in this RFI	
Phone number **Fax number** **E-mail address** **Web site URL**	
Company location (corporate office; other offices)	
Describe your network service(s) and strategy, including markets served. Include information regarding any strategic partnerships or alliances with other providers.	
Identify major customers that use your network/telecommunication/services and are willing to serve as references. Please provide the appropriate contact information including telephone numbers and email addresses. We are especially interested in any statewide or large regional networks you provide in Arizona, or other states that serve public sector institutions.	

High Level Technical Requirements

Vendors must provide network designs for the following options. For each network design option, include/describe:

High Level Technical Requirements	Response
A network configuration narrative, diagram(s) and supporting documentation as needed	
A flat rate and/or bandwidth and/or burstable based pricing model	
Strategic planning recommendations	
How does the solution leverage existing assets the vendor has in Arizona?	

Which Qualifications/Characteristics Can Be Satisfied?

Vendors must indicate whether or not the following qualifications or service characteristics are met in their response:

Which of the following Qualifications or Characteristics does the solution satisfy?	Response
Bandwidth on demand – ability to scale up and scale down as Internet needs dictate?	
Scalable, non-blocking architecture over isolated but shared (public & private) infrastructure?	
In which Arizona counties does the vendor currently deliver high speed network bandwidth?	
Is your company eligible to participate in the federal E-Rate program? Do you have a SPIN number? Describe your previous experience with the federal E-Rate program.	
Quality of Service – the ability to prioritize traffic through the network from source to destination	
How does the proposal leverage the vendor's existing assets?	
Does the proposal allow logical/virtual isolation of data transport and services to separate and secure traffic, such as local school building to the school district office or school central IT location?	
Does the proposal allow multiple access circuit technologies to attach?	

Is the vendor willing to interconnect as needed to create a seamless regional or statewide network (from an end user's perspective)? Does the proposal provide inter-connection to the Sun Corridor Terapop and/or existing university networks? Where would the inter-connection be located?	
Will connections transport voice, video, data, and Internet?	
How can your proposal provide centralized affordable security for all school districts?	
How will ISP Services be provided by the solution?	
Will the proposal support video service – including standards based HD video conferencing/telepresence, bridging, scheduling and help desk support?	
How does the solution provide for Ethernet handoff?	
Describe how your proposed technology could be used to benefit all school districts?	
Describe the type of security technology you propose to use?	

Which Network Designs or Connections are Proposed?

For the first 3 options, the network must be designed at the core and middle mile to be redundant, resilient, robust, scalable, secure and non-blocking. Clearly identify redundant paths and all single points of failure in all diagrams.

Network Designs or Connections	Response
1. Statewide or regional management contract in conjunction with a state or education partnership for all circuits and related network equipment in backbone, middle and last mile including the core nodes, aggregation nodes, secondary contracts, service and support.	

2. Individual management contracts for the network elements of core, middle-mile and last-mile service and support, or that interconnect the core, middle-mile and last-mile service and support.	
3. Single management contract for all equipment in the middle mile including the core nodes, aggregation nodes, secondary contracts, service and support. Customer is responsible for the last mile from the site to an aggregation node.	
4. Contract does not include any equipment in middle mile including the core and aggregation nodes and no managed service level agreements. Customer is responsible for the last mile from the site to the Internet and managing Video services.	

Vendors are encouraged to propose alternative network topologies and pricing models that may differ from the options that are described above.

Appendix H: Glossary of Telecommunications Terminology

3G or Third Generation Wireless: This refers to the current state of cellular wireless data communications being actively deployed as a market overlay first in urban areas and along transportation corridors. The first generation was analog and the second was digital (CDMA, TDMA and GSM).

4G or Fourth Generation Wireless: This refers to the next step up for mobile wireless currently standardized and beginning to be deployed. Fourth generation systems provide higher-speed data connections of up to 100 Mbps for high mobility users and 1 Gbps for low mobility users, both fixed and mobile.

5G or Fifth Generation Wireless: This refers to the anticipated next step up for mobile wireless beyond 4G, but not yet standardized. Fifth generation systems will likely provide higher-speed data connections, both fixed and mobile with greater spectral and/or energy efficiency with improved service quality and user experience.

Antenna: Any structure or device used to transmit and/or receive electromagnetic waves for the provision of wireless services including, but not limited to, cellular, paging, personal communications services (PCS), and microwave communications.

Asymmetric: A connection with more capacity in one direction than the other. Most DSL and cable modem links are asymmetric, with higher capacity (speed) in the downstream path.
Attenuation: the deterioration of a signal over distance. Also may be referred to as “loss”

Backbone: This refers to the highest speed and widest bandwidth point of a communications circuit or path. In most cases data sources such as shared servers are connected to the backbone, with lower bandwidth circuits extending to user stations.

Backhaul: The intermediate links between the backbone of the network and the sub-networks or provider networks. See also “middle mile.”

Bandwidth: The amount of data (capacity) that can be carried by a circuit between two points of a network. Bandwidth is typically measured in Kilobits per second or Megabits per second (shortened to Kbps and Mbps). The top speed of modems is 56 Kbps. One strand of fiber optics can carry 20,000,000,000 bits per second (20 Gbps) or more.

Base Station: The central radio transmitter/receiver that maintains communications with end user sites within a given range. Although many base station site antennas are placed on specially constructed towers, where existing structures provide a site that is higher than its surroundings, antennas can be placed on those structures. For example, antennas have been placed on water towers, grain silos, and building rooftops.

BPL: Broadband over Power Line: A technology that allows broadband services to be delivered via electric lines. BPL is discussed in the **Potential Broadband Technologies** section of this report.

Broadband: A generic term for high-speed data transmissions. The current federal definition of broadband is a minimum of 768 Kbps downstream and 200 Kbps upstream.

Cable Modem: A device used to provide data services over a cable TV network. Users in a given locality (determined by the provider) share the available bandwidth, so when many local users are connected simultaneously they experience slower network performance.

Cell: The basic geographic unit of a wireless system, also the basis for the generic industry term 'cellular.' A geographic area is divided into 'cells,' each of which is equipped with a low-powered radio transmitter/receiver. The cells can vary in size depending upon terrain, capacity demands, etc. See also Base Station, Cell Site.

Cell Site: The place where communications equipment is located for each cell. A cell site includes antennas, a support structure for those antennas, and communications equipment to connect the site to the rest of the wireless or wired network. The equipment is normally housed in a small shelter or "hut" at the base of the site. See also Base Station, Cell.

Central Office: A term used by carriers when referring to switching points. May also be called a local exchange or telephone exchange.
CLEC: Competitive Local Exchange Carrier. A new entrant in a telecommunications market previously limited to one carrier. Contrast with ILEC.

Colocation: The siting of two or more separate companies' (or departments') equipment in or on the same structure/tower or building without the need to construct a new support structure or require a substantial increase in the size of an existing structure.

Contention: When multiple customers share a finite amount of broadband capacity and simultaneous use, they "contend" or compete with one another for that limited resource. Contention may be due to increased use or to inherent system design constraints. Synonymous with oversubscription.

CPE: Customer Premises Equipment. CPE is a term that refers to any equipment that is located at the customer's site.

Downstream/download: Data transfer from the web/Internet "down" to the customer. Typically measured in thousands of bits per second (Kbps) or millions of bits per second (Mbps). See also Upstream/upload.

DS-3 (Digital Signal, Level 3): A 44.736 Mbps carrier facility, (also referred to as a T3, and generally thought of as 45 Mbps), which is the equivalent of 28-T1 connections.

DAS: Distributed Antenna Systems. An alternative wireless network technology utilizing small antennas usually mounted on existing infrastructure in the public rights-of-way, such as utility poles, and are connected to a central hub by wireless or fiber backhaul. Due to their limited power and coverage area, DAS elements are typically deployed to supplement traditional macro sites.

DSL: Digital Subscriber Line. A service providing data connectivity (to the Internet or private networks) over ordinary copper telephone lines. DSL circuits are switched, not shared as cable modems, but bandwidth can vary greatly, based on both distance and the quality of the circuit. There is typically a distance limitation of approximately 12,000 to 18,000 feet from the nearest main facility (telephone company central office or equivalent).

DSLAM: DSL Access Multiplexer. Used to aggregate many DSL connections onto a single higher-bandwidth connection/link. DSLAM equipment is typically placed in above-ground equipment cabinets within or at the edge of neighborhoods.

Ethernet: Ethernet is a family of computer networking technologies for local area networks (LANs), standardized in 1985 as IEEE 802.3 and largely replacing competing wired LAN technologies. It is generally carried over twisted pair wiring and fiber optic links in conjunction with hubs or switches at data rates from 10 Mbps to 1 Gbps on LANs and up to 100 Gbps on MANs and WANs.

FCC: Federal Communications Commission. The government agency responsible for regulating telecommunications in the United States.

Fixed wireless: Refers to wireless systems that are permanently installed and designed to cover a specific area or site.

Gbps: Gigabits per second. A thousand Mbps or a million Kbps.

ILEC: Incumbent Local Exchange Carrier. The former monopoly local telephone carrier. Contrast with CLEC.

ISP: An Internet service provider is a business or organization that offers users access to the Internet and related services. Many but not all ISPs are telephone companies or other telecommunication providers and may be organized as commercial, community-owned, non-profit, or otherwise privately owned entities. They may provide a variety of services such as Internet access and transit, domain name registration, web site hosting, and colocation.

Kbps: Kilobits per second. Thousands of bits per second.

LAN: Local Area Network. A local area network is a computer network interconnecting computers, storage, and other peripherals in a limited area such as a home, school, computer laboratory, or office building over a small geographic area using Ethernet, Wi-Fi, and possibly other short range interconnection technologies. See also MAN and WAN.

Last-mile (sometimes referred to as “first mile”): This term is used to describe the final connection to a building as opposed to the high capacity circuits extending across a city or county. This connection is often the bottleneck that prevents high-speed network connectivity, due to lack of high capacity cabling options. Contrast with “middle mile.”

Latency: The time it takes for a signal to travel between two points on a network. Also referred to as “delay”. When there is significant latency a normal voice conversation may be very difficult as the parties must wait for responses and may “talk over” each other.

Leased Line Services: These are typically communications circuits provided by a telephone company or cable company and leased for a monthly fee to a customer such as a city or school district. Typical leased lines include T-1 and T-3.

Line of Sight (LOS): Transmission limited to straight lines and in which the transmitting/receiving locations can be viewed/seen from one another. Most wireless wide area network transports require a line of sight from the sending location to the receiver.

MAN: Metropolitan Area Network. A metropolitan area network is a large computer network that spans a medium size geographic area such as a campus up to an entire metropolitan area, falling between a LAN and WAN. MANs provide Internet connectivity for LANs in a metropolitan region, and connect them to wider area networks like the Internet. See also LAN and WAN.

Mbps: Megabits Per Second - Million bits per second. Telephone modems operate at Kbps (thousands of bits per second) speeds, whereas local area networks operate at Mbps. See also Gbps.

Microwave: The portion of the electromagnetic spectrum, beginning with 1 GHz, which is used for many different wireless communications. Microwave links are often used in links where there is a line of site and a distance of less than 30 miles.

Middle mile: May also be referred to as backhaul. The links between ISPs and local or regional broadband service providers are considered “middle mile” connections. Contrast with “last mile”.

Monopole: A slender, self-supporting tower on which wireless antennas can be placed.

Oversubscription: See contention.

PROW: Public Right-of-Way or Public Rights-of-Way. The land/areas owned by a public entity such as a city or county that are used for installation of telecommunications and other services. For example, most counties own and control the PROW along county roads.

Right-of-Way (for outside plant cable): Refers to a designated space alongside a street or other access (such as a railroad line). An entity wishing to install cable among buildings must obtain the rights to a pathway for that cable. Right-of-way access must be granted by the owner of the path to be used, which may include public landowners (city, county, etc.), private landowners (railroad companies), or the owners of poles such as cable, telephone, or power companies. Cities typically require written permits for the use of their rights-of-way - usually for a fee. See also PROW.

Router: A device that “translates” among different types of network connections and speeds, and can also perform basic security functions. Routers are most frequently used at the point of incoming services such as ISP or carrier WAN connections.

Site Survey: Internet service provider personnel visit your home or business location to determine whether service is/can be made available there.

Symmetric: Used to describe communications technologies in which the upstream and downstream data rates are identical - e.g., High Bit-rate Digital Subscriber Line.

T-1 (DS1): In the United States the T-1 standard has a speed of 1.544 Mbps. T-1 circuits usually are provided by telephone companies using copper cabling, but fiber and wireless systems can be set up to provide T-1 connectivity as well.

Take Rate: The percentage of households or business that are offered service who choose to subscribe to that service. For example, if DSL service were available to 100 households and 33 elected to "take" that DSL service, the take rate would be 33%.

Underserved and Unserved: The FCC recently defined these terms that describe areas that lack broadband access. For complete definitions refer to the July 9, 2009 Federal Register Notice of Funds Availability (NOFA) at: http://www.ntia.doc.gov/files/ntia/publications/fr_bbnofa_090709.pdf.

Upstream/upload: Data transfer from the customer back to the web/Internet or provider. Typically measured in thousands of bits per second (Kbps) or millions of bits per second (Mbps). See also Downstream/download.
VoIP: Voice over Internet Protocol. A technology that puts voice (telephone) conversations over an IP "data" network. Can be used to aggregate (or "trunk") multiple calls between buildings, or for individual calls from an IP-enabled telephone or from a computer equipped with a microphone and speaker. Skype is one example of VoIP.

VPN: Virtual Private Network. A network set up for specific sites and users and open only to authorized users. A VPN uses encryption to prevent communications from being deciphered by non-authorized personnel.

WAN: Wide Area Network. A wide area network is used to extend connectivity beyond a building or campus, usually through telephone carrier facilities, but may also be privately installed and owned. See also LAN and MAN.

Wi-Fi: Wi-Fi is a popular technology that allows an electronic device to connect to a LAN and through it to exchange data or connect to the Internet wirelessly over unlicensed spectrum with various levels of encryption and security. Devices connect to network resources via a wireless network access point (AP) or hotspot with a range of up to about 65 feet indoors and greater distances outdoors depending on configuration, antennas, and mesh connections with other Wi-Fi APs. Wi-Fi is defined by IEEE 802.11 wireless LAN standards

WiMAX: WiMAX (Worldwide Interoperability for Microwave Access) is a wireless communications standard designed to provide some 30 to 40 megabit-per-second data rates and up to 1 Gbps for fixed locations enabling the delivery of last mile wireless broadband access as an alternative to cable and DSL. It is similar to Wi-Fi, but it can enable usage at much greater distances and speeds. WiMAX is defined by IEEE 802.16 wireless LAN standards ratified by the WiMAX Forum. A variant, Mobile WiMAX is being selectively employed to complement or compete with 4G mobile wireless.

Wind load: The designed capacity of a tower to withstand wind forces. Each structure (mast, antenna, etc.) added to a tower adds to the overall wind load of that tower.

WISP: Wireless Internet Service Provider. A company that distributes Internet service via wireless networking. In order to provide service to a given location or territory. A WISP may develop its own tower sites and/or may lease space on towers or structures owned by others.